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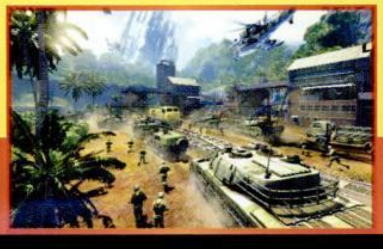

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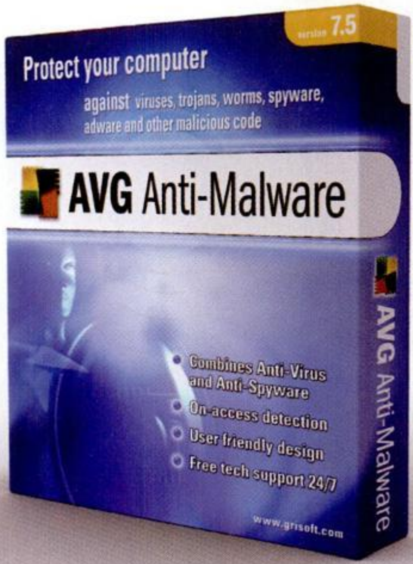

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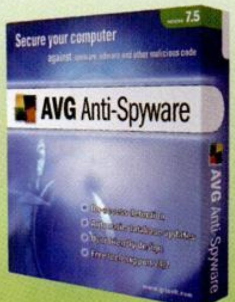

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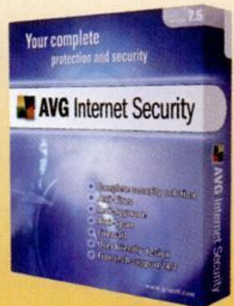

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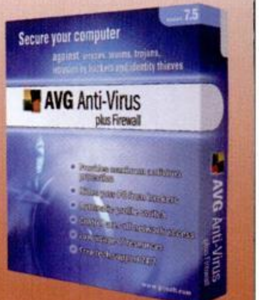

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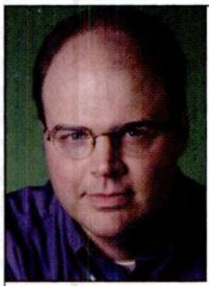


Release Notes

The Winds of Change

If you're a serious PC gamer—like most of us here at *Maximum PC*—you're probably used to upgrading your rig with some new kit every six months or so, and maybe building a new system every 18 months or two years. If you're staring at either route right now, it may feel as if you're standing on the edge of a massive precipice—and that stiff wind in your face is the harbinger of change.

Traditionally, late fall and early winter are popular times to fiddle with our machines, as that's when the latest and greatest games—and plenty of new hardware—hit shelves. That's certainly still the case this holiday season: You'll find loads of hot games, and an abundance of smokin' new videocards and mobos, to choose from.

The wrench in this otherwise appealing recipe is Microsoft's upcoming release of its new OS, Vista, which will bring with it a new version of DirectX. DirectX 10 promises an almost obscene step up in the level of eye candy you can expect from an A-list game, which is the great news. The bad news is, you'll need a new videocard to get those gorgeous graphics. The current generation of DX9 hardware will be left out in the cold—they'll still run 2007's games, but not with all the bells and whistles turned on.

So you may want to think twice about sinking the majority of your upgrade cash into a new $500 videocard right now—there are some excellent mid-range cards that will get you by until DX10 parts flood the market. (Check out our preview of nVidia's hot-off-the-assembly-line 8800 on page 29.)

When the winds of change start blowing, we like to go fly a kite: We build a sweet gaming rig that we consider to be a great compromise. We selected parts that'll give us a machine beefy enough to handle the most intense games right now, and one that presents a relatively painless upgrade path to Direct3D 10 gaming goodness once Vista ships early next year.

More good news: Vista and D3D 10 will have little impact on the myriad other upgrades you might want to consider—perhaps a widescreen display, a fat hard drive, a new HD optical drive, and so on. And we've got you covered there as well in our gargantuan hardware buyers guide, which lays out the technological landscape for every major hardware category.

Plus, we show you how to upgrade two of everyone's favorite games—*Half-Life 2* and *Oblivion*—with mods you can download for free off the web. Just look at this as our gift to you: a way to get more fun out of your existing games, and maybe pocket some extra cash for that upcoming DX10 videocard.

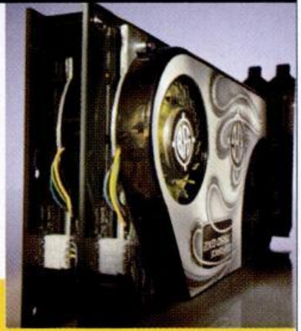
—Steve Klett
Steve@maximumpc.com

CONTENTS PC GAMING HARDWARE GUIDE WINTER 2007

Hardware Buyers Guide

10

Expert advice for selecting the fastest parts to upgrade your gaming rig, or to build a new system. Everything you need to know about:



- CPUs
- Motherboards
- Videocards
- Hard drives
- Displays
- And more!

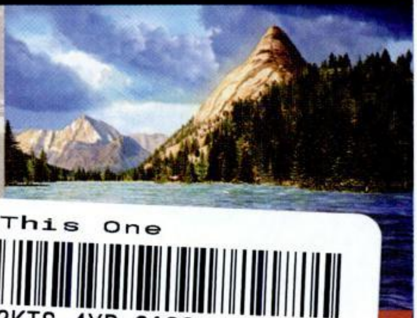
58 Game Rig Build-Out!

BATTLEFIELD 2
PREY
CALL OF DUTY 2

We show you our hardware choices for building a smokin' gaming PC for less than $1,700.

66 Direct3D 10 Exposed!

Vista and DirectX 10 are coming—fast! We tell you everything you need to know!



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CONTENTS

PC GAMING HARDWARE GUIDE

WINTER 2007

77 Make Your Own Game Movie!

Direct, shoot, and edit your own game flick—we show you how!

82 Revitalize Your Games With Mods!

Make *Half-Life 2* and *Oblivion* worth playing all over again with FREE mods. And learn how to make your zombie mod for *Oblivion*!

96 Win this Videocard!

Sapphire's giving away two screaming-fast cards, but you can't win if you don't enter!

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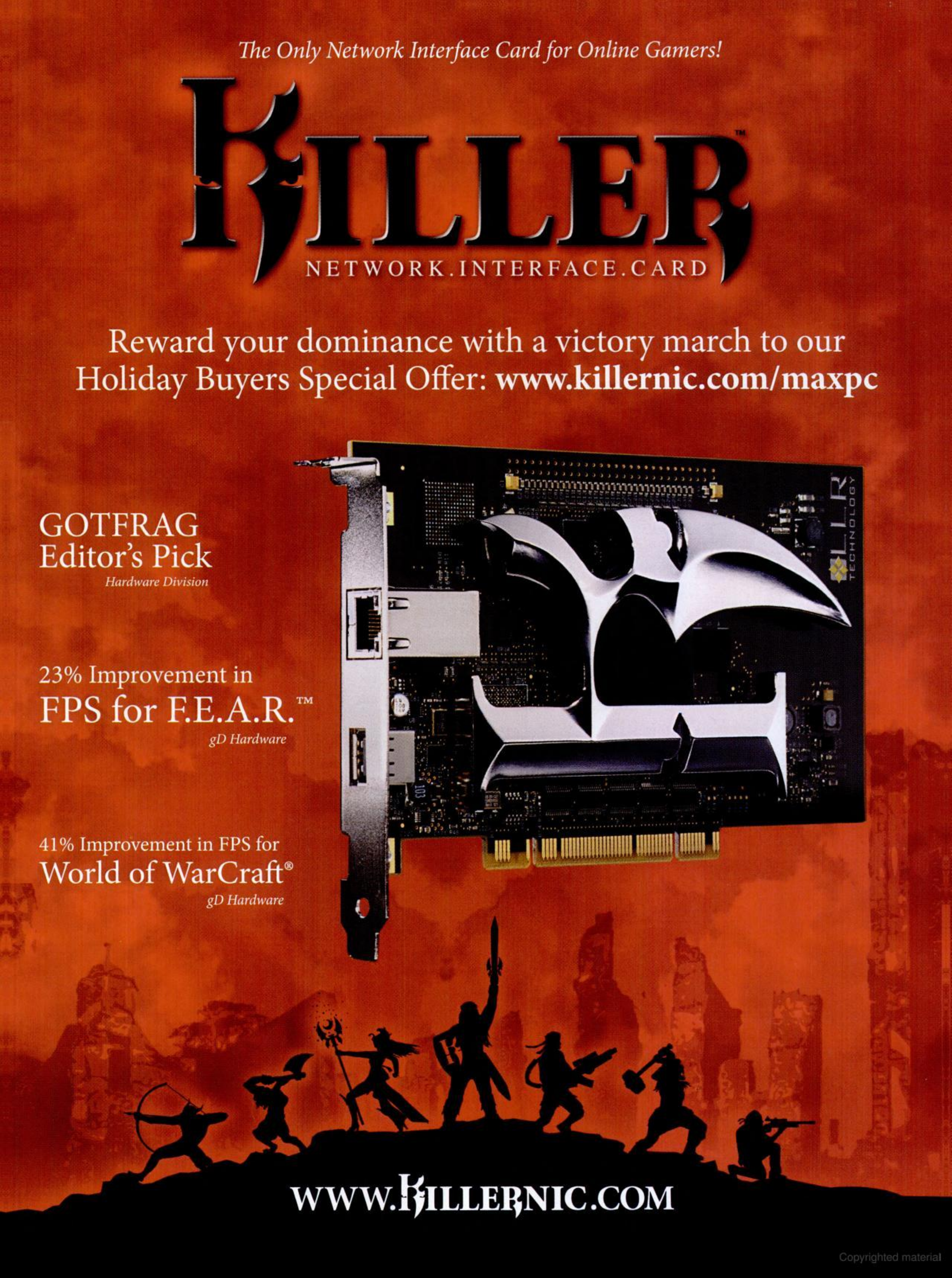

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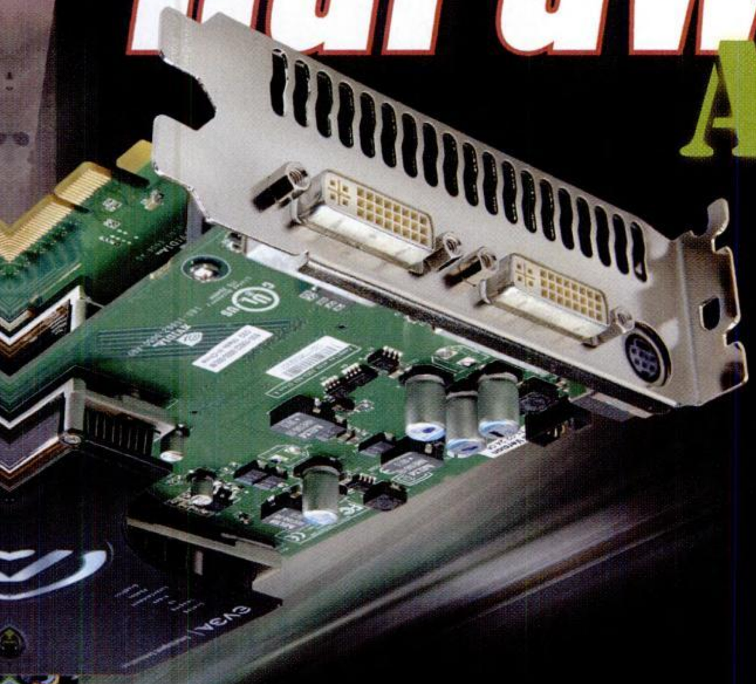


Everything you need to build or upgrade a kickass gaming PC!

AH, IT'S THAT HOLIDAY TIME OF YEAR AGAIN: You've stuffed yourself with Turkey and now you're getting ready for St. Nick to make his appearance (you have been good, right?). While most people's thoughts turn to Rockwell-style family moments spent telling yarns and sipping cocoa in front of the fire, and spreading joy and feelings of goodwill, ours focus on new PC hardware, naturally! What loot should we ask for (or buy for ourselves) this year? Do we need a new system, or can we upgrade?

Whichever route you choose, we've got you covered in the following pages. Our massive buyer's guide will tell you everything you need to know about the latest mobos, CPUs, videocards, displays—everything and anything you'd want for a gaming rig that will make your friends green with envy. Vista and DirectX 10 are coming, and so are pixel-munching games like *Crysis*. Make sure you're ready!

PROCESSORS, PAGE 12
MOTHERBOARDS, PAGE 14
VIDEOCARDS, PAGE 25
HARD DRIVES, PAGE 36
DISPLAYS, PAGE 40
CASES, PAGE 46
AUDIO, PAGE 50
OPTICAL DRIVES, PAGE 52
CONTROLLERS, PAGE 52

Processor Pontification

Dual or quad? AMD or Intel? We tell you which one

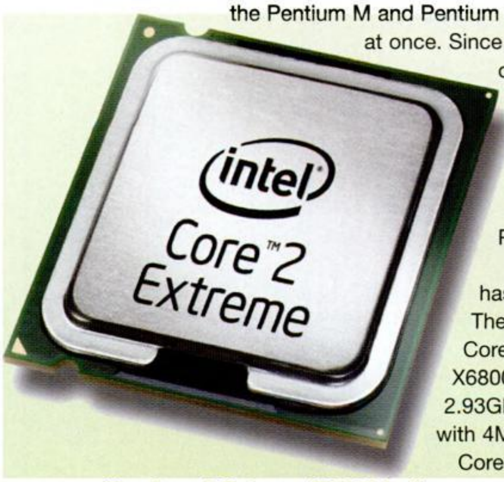
Technology doesn't stand still. It runs, and if you get in its way, it runs you over. While last year the big question was whether to buy a dual-core CPU, this year, the question is whether you should buy a quad-core CPU. Yup, four execution cores (think of each execution core as its own CPU) in one!

Last year, AMD and the Athlon 64 were hot, and this year they're not. Right now, Intel's brand-new Core microarchitecture and the Core 2 Duo and Core 2 Extreme CPUs are the rage.

INTEL

Intel has three flavors of CPUs that are based on its new Core microarchitecture, which replaces the old Netburst microarchitecture used in the Pentium 4, Pentium D, and Pentium Extreme Edition CPUs. The Core microarchitecture is a descendant of Intel's spectacular Pentium M CPU, but with quite a few changes under the hood. Core 2 Duo shouldn't be confused with the Core Duo, which was Intel's original short-lived mobile dual-core processor. The Core 2 Duo and Core 2 Extreme were intended to be desktop CPUs that would put the company back on top, which they've done.

The mantra for the Core CPU is "faster, wider, and cooler," which means it can execute more math in fewer clock cycles, and because it's 33 percent "wider" than both the Pentium M and Pentium 4, it can do more at once. Since it's a descendant of the mobile Pentium M, it runs almost half as hot as a comparable Pentium 4 or Pentium D CPU.



The Core 2 Extreme X6800 is the fastest dual-core on the planet!

The CPU really has three versions. The top part is the Core 2 Extreme X6800, which runs at 2.93GHz and comes with 4MB of cache. The Core 2 Duo version is essentially the same chip but at lower clock speeds; we say "essentially" because on the two lowest versions of the CPU, the available L2 cache is cut in half to 2MB. All operate on a 1,066MHz front-side bus. The Extreme has one main feature that the Duos don't: it's not multiplier-locked, which aids in the "dark art" of over-clocking.

In performance showdowns, Intel's Core 2 series has proven to be superior to AMD's current CPUs in just about every application or game we could find. And the Core 2 is much faster than its AMD contemporaries when it comes to media-encoding, video-editing, and photo-editing tasks. If we had to buy a new system today, we wouldn't want anything but a Core 2, or at least a system that will let you easily upgrade to one.

Though the Core 2 impresses us, Intel still has a large stable of older Netburst-based CPUs. These chips are a steal and offer good performance for average users, but in the performance pecking order for gamers, it's Core 2, then the Athlon 64 FX/X2 series, and then Intel's Pentium D CPUs.

AMD

The PC Surgeon General warns us that kicking your opponent in the butt for two years can lead to victory disease, and that's what we think happened to AMD. With the company's vaunted on-die memory controller and more efficient execution cores, it was blindsided by Intel's faster and cooler Core 2 chips. Just about everywhere you look, the Core 2's simply offer superior performance to AMD's processors.

AMD
64
Athlon™ FX

Long the darling of gamers, AMD's famous Athlon 64 now plays second fiddle to Intel's Core 2

This year AMD completed its transition to the AM2 platform, which does away with the old warhorse Socket 939 interface and DDR memory. AM2 looks similar to Socket 939, but the two are incompatible. AMD did this purposely to prevent consumers from plugging AM2 CPUs—which support only DDR2 memory—into Socket 939 boards that support only DDR (and vice versa).

The key differences between the top Socket 939 CPU and the current top Socket AM2 are about 200MHz, DDR2, and Secure Virtualization Machine Technology. This technology, like its Intel Virtualization Technology counterpart, promises higher performance when running multiple operations simultaneously or within a virtualization product such as Parallels (www.parallels.com). No current games take advantage of Intel's VT or AMD's SVMT, so there's no reason to worry about it.

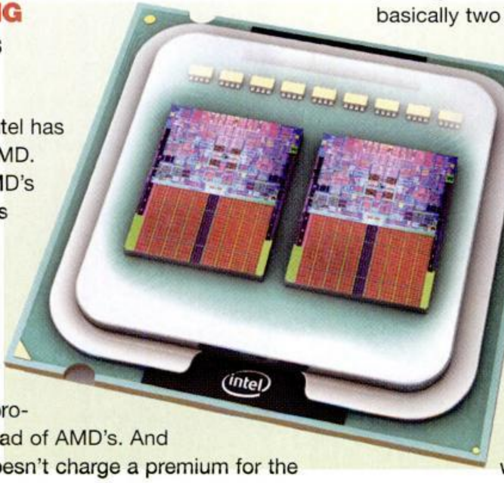
AMD's move to DDR2 memory was long overdue, but the performance boost was minimal. In our testing, we've found at best a 5-percent increase in performance when comparing a Socket 939 CPU at the same clock speed to an AM2 CPU. Why? DDR2 offers increased bandwidth over DDR RAM, but DDR2's heightened bandwidth comes at the expense of higher latency, which could be to blame for the lackluster results. The latency can be overcome, but RAM manufacturers have been slow to fabricate chips with low latency. (Because of the on-die memory controller, AMD chips have always favored lower latency.)

AMD's top processor is its dual-core Athlon 64 FX-62, which clocks in at 2.8GHz and features 2MB of cache. Next on the list is the dual-core Athlon 64 X2 5200+, which clocks at 2.6GHz and also features 2MB of cache (1MB per core). The FX-62 is an unlocked processor, so you can set its multiplier at will, while the X2 is locked. In bang-for-the-buck land, the 5200+ is a far better buy than the FX-62.

If we had our druthers, we'd prefer a Core 2 system for gaming today, but the AMD does have some life left in it. The company is expected to release its quad-core CPU late next year, and it should slot into an AM2 board without a hitch. Of course, with Intel, you can do that today.

QUAD COMPUTING

Do you need four CPUs for gaming?



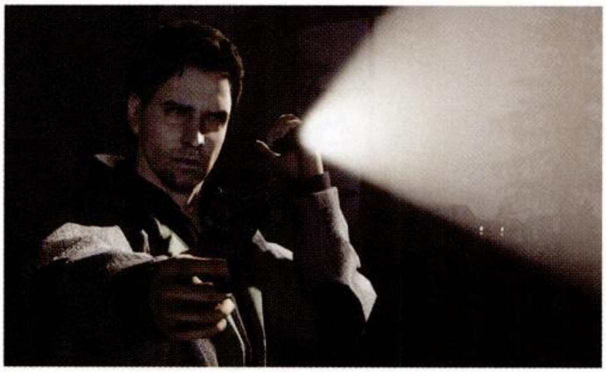
Payback's a bitch, and Intel has it out for arch-nemesis AMD. First, Intel devastated AMD's vaunted Athlon 64 with its new Core 2 CPUs. And then, just to rub a little salt into the wound, Intel took two of its Core 2 CPUs and jammed them into one CPU to introduce its quad-core processor almost a year ahead of AMD's. And to make it worse, Intel doesn't charge a premium for the quad-core.

Quad-core may not cost more, but it has some hidden costs. The Core 2 Extreme X6800 clocks in at 2.93GHz while the quad-core Core 2 Extreme QX6800 clocks at 2.66GHz. Why the lower clock speed? Intel says quad-core's increased thermals means that a little clock speed had to be sacrificed to get four execution cores into the same CPU package. The CPU also sucks more power because it's basically two Core 2's under one lid.

The snag for gamers is that few of today's games effectively use even two cores, so four cores just means another two freeloaders are along for the ride. Even today's multi-threaded games are optimized only for dual-cores, not four. So giving up 267MHz now for future quad-core benefits will cost you some framerates today.

However, we think that perspective is short-sighted. Next-generation games such as Alan Wake and Crysis will take advantage of the extra cores. Better yet, if you're really concerned about losing 267MHz, you can easily over-clock the QX6800 to X6800 speeds without breaking a sweat.

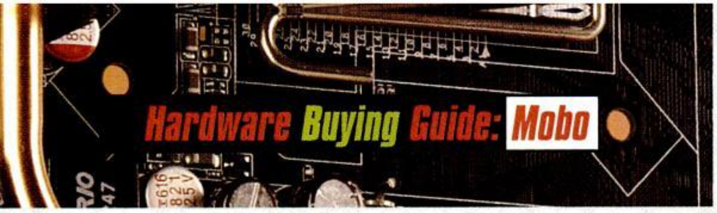
With the price of the Core 2 Extreme QX6800 being the same as an X6800, it just doesn't make sense not to buy a quad-core.



Next-gen games, such as *Alan Wake*, will make use of quad-core CPU horsepower.

TOP CPUS AT A GLANCE:

MODEL NUMBER	INTEL CORE 2 EXTREME X6800	INTEL CORE 2 EXTREME QX6800	AMD ATHLON 64 FX-62	AMD ATHLON 64 FX-5200+
FREQUENCY	2.93GHz	2.66GHz	2.8GHz	2.6GHz
PROCESS	65nm	65nm	90nm	90nm
EXECUTION CORES	2	4	2	2
L2 CACHE	4MB	8MB	2MB	2MB
FEATURES	SSE,SSE2,SSE3, SSE+, AMD64, NX	SSE, SSE2, SSE3, SSE+, AMD64, NX	SSE, SSE2, SSE3, AMD64, NX	SSE, SSE2, SSE3, AMD64, NX
PRICE PER 1,000	$999	$999	$713	$403



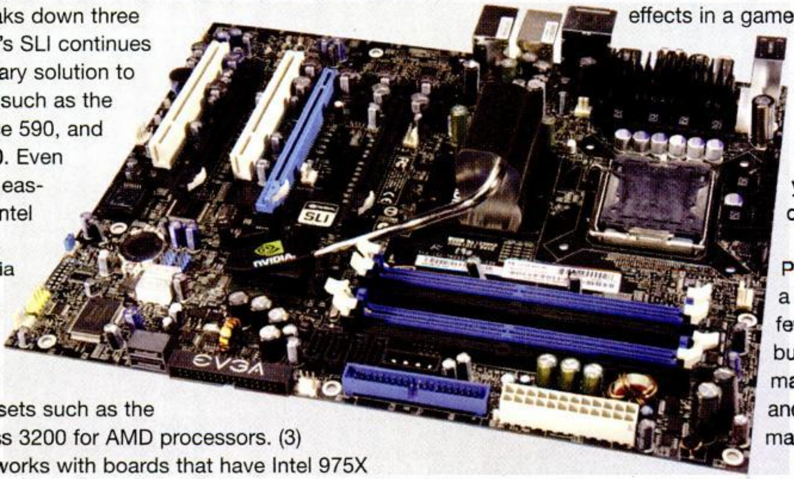
Motherboard Mojo

Everything you need to know about the mobo landscape!

If you've ever created a character for a role-playing game, you know how important it is to pick the right class. Choosing to start as a Paladin, Thief, or Wizard determines what weapons you can use and what armor you can wear.

A motherboard, amazingly, isn't that different than a game of D&D. Choose a motherboard with a single x16 PCI Express slot, and you'll never be able to run two video cards. Select the wrong core logic chipset, and you may not be able to run the dual-graphics cards you want.

The motherboard, though important, should be picked **after** you've decided what graphics to go with. If you intend to build a machine to play games at ultra-high resolutions, a dual-card graphics setup may be the ideal situation. Today, that breaks down three ways: (1) nVidia's SLI continues to be a proprietary solution to nVidia chipsets such as the nForce 4, nForce 590, and new nForce 680. Even though SLI can easily be done on Intel or ATI chipsets, apparently nVidia doesn't want to share. (2) ATI's CrossFire currently runs on its own chipsets such as the CrossFire Xpress 3200 for AMD processors. (3) CrossFire also works with boards that have Intel 975X chipsets that sport two x16 PCI-E slots, as well as some 965p chipset boards. ATI doesn't currently have an Intel chipset, but it plans to add one later this year or early next year.


nVidia's newest chipset, nForce 680, is hitting shelves on mobos near you right now!

Which dual-graphics chipset is the right way to go? That's impossible for us to tell you from a motherboard perspective, but we can say that SLI is certainly implemented better. ATI's CrossFire currently uses an ungainly dongle that's been the butt of industry jokes. (The brand-new x1950 Pro does away with "the dongle"; see review on page 30.) And with AMD buying ATI earlier this year, speculation abounds that ATI won't even be supporting Intel chips (and that nVidia won't support AMD CPUs). The speculation is exactly that if you believe the company officials we've talked to: the companies are in the business to make money, and no one's saying that has changed with the buyout.

Once you've decided which CPU and graphics cards you want to go with, you'll also need to pay close attention to these particular areas:

PCI EXPRESS. PCI-E has made short work of AGP, and it looks like it's starting to crowd out PCI as well. Just two years ago, a PCI-E board meant that a board had a single x16 PCI-E slot and an x1 slot. Today, boards feature three x16 slots and even more x1 and x4 slots for add-in cards.

If you plan to run a dual-graphics solution, you'll of course need two x16 slots. The slots can be physical x16 slots or x8 electrical, meaning the slots take full-length PCI-E cards but run at only half the data rate of an x16 slot. Though it's appealing to have two x16 slots that each support 8GB of bandwidth, we haven't yet seen a huge negative impact from running dual x8 graphics cards. Both nVidia and ATI are actually pushing for you to have a third x16 slot to run a third graphics card to process the physics effects in a game. What about additional x1 and x4 slots? Just like last year, we don't think this will be a make-or-break category. As long as you have enough slots to run your two (or three graphics cards), you're fine.

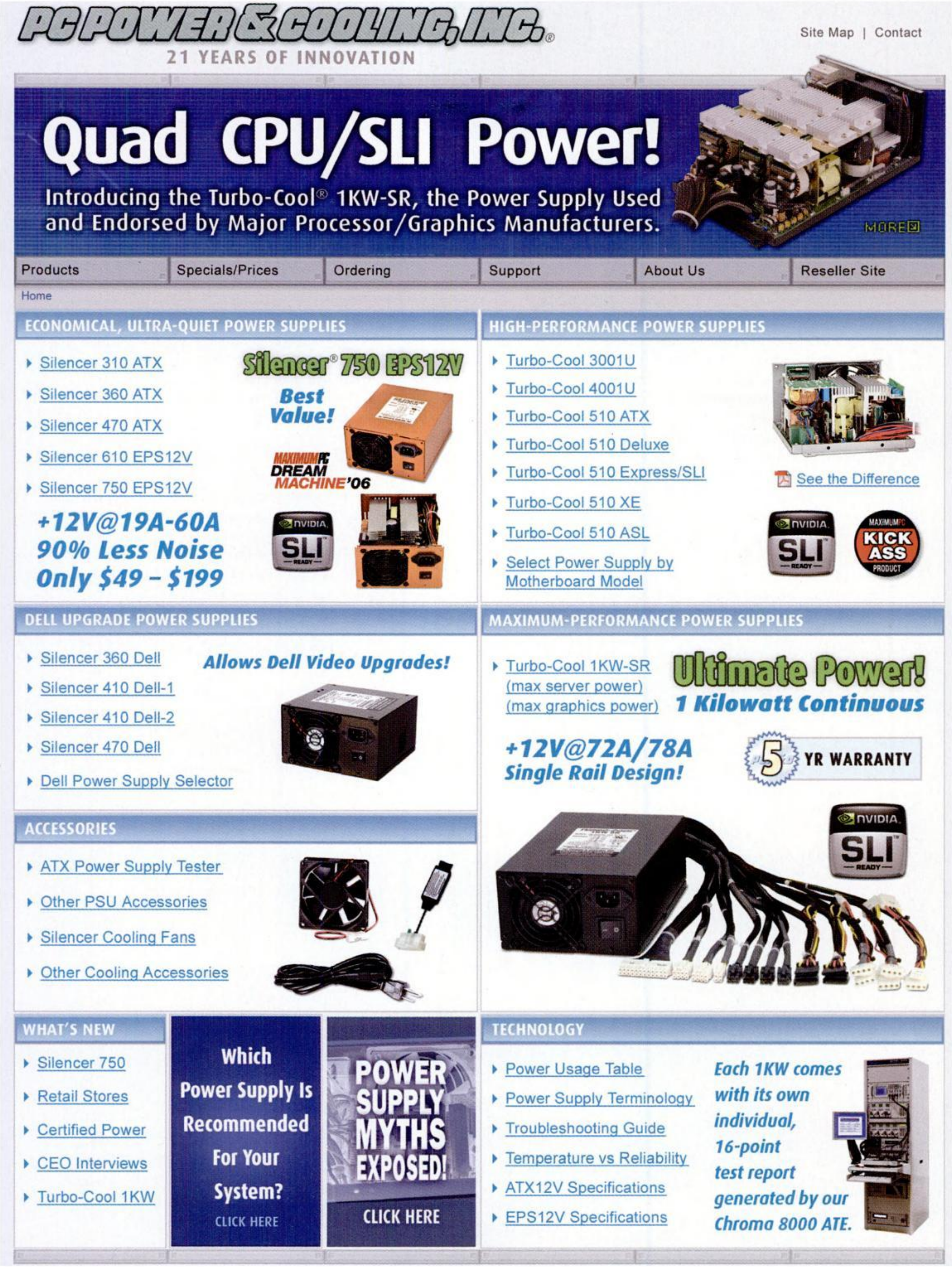
We're just not seeing PCI-E components making a splash yet. We've seen a few SATA raid controllers, but that's it. Creative hasn't made the move to PCI-E yet, and few other add-in–board makers are doing it either.

Next year, we'll actually start seeing motherboards and cards that support the second generation of PCI-E, but you shouldn't worry about that today. Gen 2 doubles the speed, so an x16 slot goes from about 8GB to 16GB of bandwidth.

INTEGRATED AUDIO. Are free things worthless? In some cases, yes. While we've generally thought that Intel's HD Audio spec has helped improve the audio fidelity of onboard sound, not all is well. CODEC maker Realtek was recently accused by its competitors of faking its EAX support, and our own in-house testing has confirmed this charge. Use a game that supports Creative Lab's older EAX API with a motherboard using Realtek parts, and it sounds terrible. We haven't been able to reach Realtek to see if it plans to fix the problem, but right now, we're wary of any motherboard with Realtek audio hardware.

We're fine with Sigmatel and Analog Devices CODECS,

Continued on page 16→



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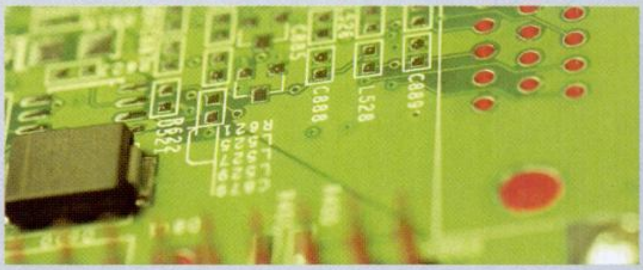
Continued from page 14→

but Realtek seems to be prevalent on 90 percent of the consumer motherboards we see today. In other words, don't run integrated audio. Instead, buy a Creative Labs X-Fi and call it a day. (See page 50 for more on the X-Fi.)

FRONT-SIDE BUS. AMD users can skip this section, as there is no front-side bus with their CPUs, but Intel users should pay attention. Intel's current dual-core and quad-core chips top out at 1,066MHz on the front-side bus. Everyone expected Intel to introduce a 1,333MHz FSB with its quad core CPUs, but the company backed off of those plans for unknown reasons. That doesn't mean this change won't come next year, though. In fact, we'd be surprised if Intel didn't introduce a 1,333MHz FSB next year. You need to know this because if you want to upgrade to 1,333MHz FSB CPUs, you'll need a motherboard that supports it. We've seen several motherboards whose makers report that they unofficially support 1,333MHz FSB, and we wouldn't want one that didn't if we were concerned about upgrading.

THE RIGHT DUAL-CORE SUPPORT. AMD users can also skip this section because, well, the company seems to be able to deliver better than Intel. All AM2 motherboards support dual-core and all of the company's CPUs. Intel, on the other hand, has completely fracked it up: Because of the lower voltage requirements of the new Core 2 dual-cores and quad-cores, many older LGA775 mobos don't work with the chips. If you're checking out an Intel motherboard, make sure the box specifically says that it works with the Core 2 or Conroe CPUs before you buy it.

Signs of improvement are cropping up, however: With the proper BIOS update, the majority of motherboards designed for dual-core Core 2's should work perfectly fine with Intel's quad-core processors.



BTX. The Balanced Technology eXtended spec is acknowledged by most to be on the way out—dead before it ever really caught on. While we think it has numerous good features, the spec was clearly designed around white-hot CPUs as the center of the PC universe. That's no longer the case: today's GPU is just as important (if not more important) to some people. Hopefully, the spec that supersedes BTX will acknowledge that. For now, stick with the tried and true ATX motherboard and you can't lose.

WHAT ABOUT THE POWER SUPPLY?

High-performance computing requires a good-quality power supply—and you can bet that the free PSU that came with your $50 case isn't good-quality. As with RAM, we recommend that you buy a name-brand power supply that's matched for your components. If you're running a dual-graphics card setup, check nVidia and ATI's websites for power supplies that have been certified to work with their dual-card setups. We recommend a minimum of 650 watts for dual-graphics cards, and we recommend you use an SLI-certified PSU. If you're looking to the future, buy as much power as you can afford. nVidia's next-generation GeForce 8800GTX graphics cards actually feature two 6-pin PCI-E power plugs, so SLI would require *four* power plugs. All new motherboards feature a 24-pin power connector in addition to either a 4-pin ATX 12V power plug or an 8-pin EPS 12V plug. We recommend that you buy a PSU with a 24-pin connector and an 8-pin connector. You can always go from 8 to 4, but going from 4 to 8 is not recommended.

WHAT ABOUT RAM?

With AMD finally adopting DDR2 RAM, DDR is finally aboard the night train to the big adios. For the next 12 to 18 months, DDR2 is the safest bet in town. There are numerous types of bling-bling RAM on the market. Most of it is designed for the overclockers who need to hit speeds beyond the official DDR2/800. We recommend that you buy based not on bling-bling, but on brand and warranty. RAM is a commodity product, but there's a world of difference between no-name generic RAM and parts from reputable vendors. Generally, a good warranty means a good product. We recommend a minimum of 1GB of RAM, with 2GB being the optimal amount. New chipsets support up to 8GB of RAM using four DIMM slots, but 2GB DIMMs are cost-prohibitive, and you'll need to run a 64-bit OS to support more than 4GB of RAM.

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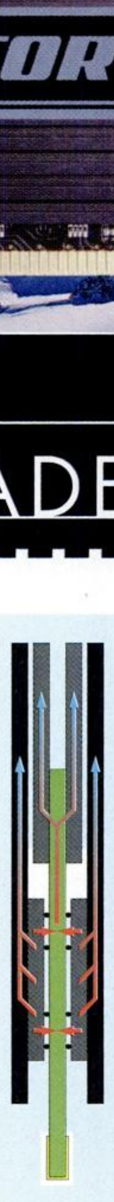
Here's the latest in Corsair's ten year heritage of innovation in performance memory: we've redefined memory heat sink technology. And the result is unprecedented performance and reliability. When we ran a preview module through system benchmarks at COMPUTEX, an overclocked DHX module with our optional airflow fan was able to hit a heart-stopping 1250MHz (PC-10,000) while maintaining cool, reliable performance.

Protect Components While You Push Performance

Pushing performance specs generates heat, and that can compromise reliability and component life. The advanced cooling ability of DHX heat sinks keeps your memory safe and reliable even as you push it to the limit. Under the name XMS2 Dominator, this DHX technology will be showing up on both Corsair parts designed for extreme overclocking and on memory designed for performance computing and gaming.

Also Featuring Enhanced Performance Profiles (EPP)

As with all new Corsair performance memory, XMS2 Dominator modules feature EPP, the new open standard for the Serial Presence Detect (SPD) jointly developed by NVIDIA and Corsair. EPP simplifies overclocking for beginners and provides unparalleled control for experts.



AIRFLOW

An optional fan (not shown) provides even more cooling and protection.

DHX DUAL-PATH HEAT XCHANGE

Corsair's proprietary DHX technology dissipates heat two ways: it draws heat away from the module through the RAMs and provides an additional path for heat transfer within the module through the ground plane!

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MIDRANGE CPUs

Intel Core Duo **vs.** AMD Athlon 64 X2

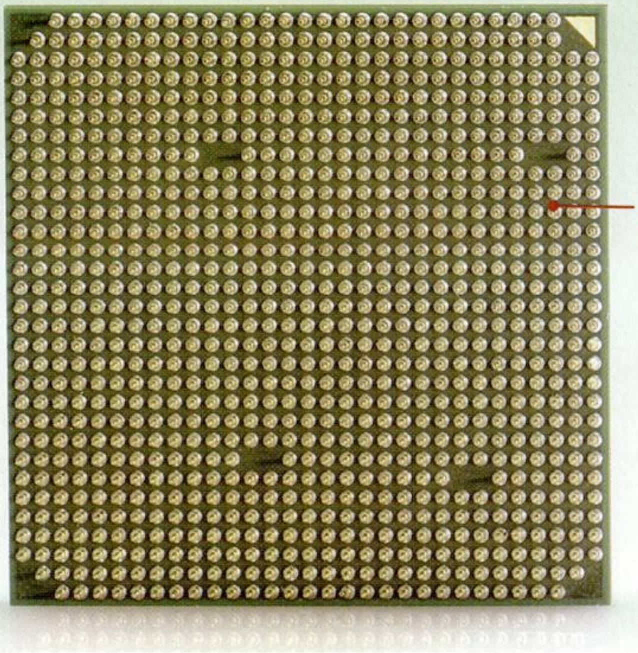
Maximum PC loves covering high-end CPUs—it's always Extreme this or FX that. But to the average Joe or Jane, dropping $1,000 on a CPU is plain nuts. What about CPUs that the masses can afford? Well, we hear you loud and clear, so we've devised a CPU shootout that'll keep your wallet fat and your accountant happy.

Here, we pit Intel's hot new Core 2 Duo E6600 against AMD's stupendous Athlon 64 X2 5000+. Both are dual-core procs and both are priced at about 300 bones. We cleared off a bench in our Lab and paired the two CPUs with the most popular chipset for their respective platforms (975X for the Intel and Nvidia's nForce 590 for the AMD). Then we equipped them with the same hard drive, graphics card, and RAM before we updated both boards with the latest drivers and BIOS available. Finally, we reached for benchmarks that would pound the CPU to determine which is the best cheap chip.

BY GORDON **MAH UNG**

round 1 AVAILABILITY

Initial complaints about Intel's Core 2 being difficult to find seem to have been resolved. We took a swing through a local large retailer and found Intel's entire lineup available. Surprisingly, it was AMD's AM2 parts that were in short supply. And a check of Pricewatch.com showed only two vendors with the 5000+ available, but 10 vendors pushing Intel's E6600. It came as a surprise to us, but it's pretty clear there's a shortage of 5000+ parts right now. Perhaps it's Dell sucking up all the inventory.
WINNER: CORE 2 DUO



AMD ATHLON 64 X2 5000+, $300, www.amd.com

round 2 PRICING

We know we said both processors are $300 midrange chips. And they are, mostly. The wholesale price of the Core 2 Duo E6600 is $315 while the Athlon 64 X2 5000+ is listed at $300 (when both processors are purchased in quantities of 1,000). However, those prices don't seem to be reflected in street pricing. Normally, CPUs sell below their 1K unit price, but we found the E6600 costing from $330 to $370 at fairly legitimate online stores. Not great, but not horrible like it is on the AMD side. At online stores, we found the 5000+ chip starting at $370 and hitting a ridiculous $600. Huh? *Exsqueeze* me? The price of the chip was so high, we thought about using an Athlon 64 X2 4600+ instead.
WINNER: CORE 2 DUO

round 3 MOTHERBOARD AND CHIPSET SUPPORT

What good is the CPU if it has no pony to ride? The world seems to be awash in Core 2 Duo boards today, but they're all based on Intel's P965 or 975X chipsets. They're respectable boards, but they just won't cut it if you're looking to buy a pair of graphics cards with the money you save on the CPU. It's worse on the Nvidia side, which mysteriously hasn't been able to ship its nForce 590 Intel Edition chipsets to the masses. For the AM2, you can get just about any flavor chipset you want, so AMD nabs this category.
WINNER: ATHLON 64 X2

round 4 FEATURES

Let's compare these two processors to their Fifth Avenue siblings: the FX-62 and X6800. AMD drops the clock only 200MHz (about a 7 percent reduction) to make the 5000+. But AMD also cuts the L2 cache of each core to 512KB—half that of the FX-62. The E6600 is also two notches down from the top and gimped two ways: It's multiplier-locked, to prohibit easy overclocking, and Intel chopped a whopping 533MHz (18 percent!) off the chip's clock speed. Fortunately, the entire 4MB of shared L2 cache is intact. We call this the "crippled" category; but really, considering how much power you get for 70 percent less cash, the winner is obvious.

WINNER: EVERY TIGHTWAD IN TOWN

round 5 PERFORMANCE

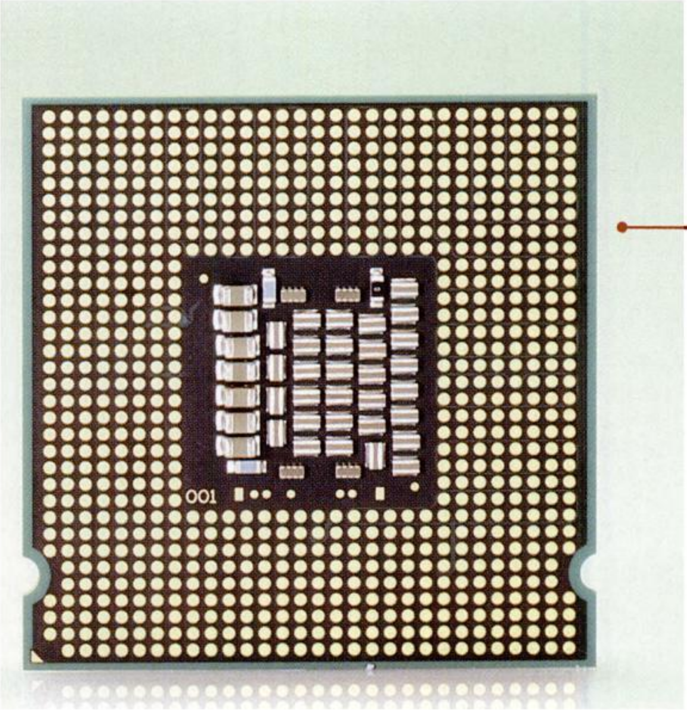
We all know that performance is what really matters. Intel's top-gun Core 2 Extreme X6800 outclocks AMD's fastest—the 2.8GHz Athlon 64 FX-62—by about 133MHz, and the X6800 outperforms the latter by 20 to 50 percent in the benchmarks. But can the Core 2 work its magic with a 200MHz disadvantage? Turns out, yes. The Core 2 Duo E6600 outruns the Athlon 64 X2 5000+ in just about every category: From gaming to image editing to video encoding and editing, the Core 2 Duo E6600 was the clear winner. We could find only one benchmark that the E6600 lost: *ScienceMark 2.0,* which Intel has long accused of being "pro-AMD." We saw the Core 2's greatest advantage in applications; the delta in our gaming benchmarks was closer, with the 5000+ earning scores 5-to-16 percent slower than the Intel chip.

WINNER: CORE 2 DUO

BENCHMARKS

	2.4GHZ CORE 2 E6600	2.6GHZ ATHLON 64 X2 5000+
CACHE	4MB / 4MB (shared)	1MB / 512KB
BIBBLE 4.81A RAW CONVERSION (SEC)	**597**	911
PREMIERE PRO 2.0 HDV TEST (SEC)	**2,251**	2,850
PHOTOSHOP CS2 (SEC)	**255**	297
PC MARK 2005 OVERALL	**6,892**	6.573
PC MARK 2005 CPU SCORE	**5,727**	5,346
SCIENCEMARK 2.0 SCORE	1,363.30	**1,452.73**
QUAKE 4 LOW QUALITY 640X480 (FPS)	**152.4**	146.2
3DMARK06 CPU SCORE	**2,052**	1,952
3DMARK05 CPU SCORE	**8,918**	7,657

Best scores are bolded. We tested the Core 2 Duo on an Intel D975XBX motherboard and the Athlon 64 X2 on an Asus M2N32-SLI board. We used 2GB of DDR2/800 RAM, a WD4000KD drive, an eVGA GeForce 7900 GTX, Corsair DDR2/800 RAM, a PCPC1KW PSU, and the same drivers where applicable for all tests.



INTEL CORE 2 DUO E6600,
$315, www.intel.com

And the Winner Is...

With pricing, availability, and performance all going to the Core 2 Duo, it's a slam dunk win for Intel. It's pretty clear that it's going to take an updated core for AMD to be competitive. MPC

Asus P5W DH Deluxe

Conroe cometh via Intel's 975X chipset

It's hard to imagine what else Asus could have added to the P5W DH Deluxe board.

Asus' P5W DH Deluxe could be the ultimate 975X board with its handy remote, driverless RAID, and onboard Wi-Fi. Our favorite feature of the P5W DH Deluxe, though, is the simple fact that it works with the Core 2 Duo and Extreme CPUs.

The P5W DH Deluxe also adds a mix of new tricks to the 975X chipset, such as the aforementioned remote, which lets you turn your PC on or off.

Asus went plumb crazy with the storage options: The board includes Intel's Matrix RAID-ready ICH7R south bridge and the integrated JMicron controller (which lets you create RAID 0 or 1 using an internal SATA drive and an external eSATA drive). We're not sure what exactly you'd use an internal/external RAID array for, but the chip also supports non-RAID options, and it gives you a valuable second PATA port.

Even more interesting is the Silicon Image 4723 controller chip, which supports driverless RAID 0, RAID 1, and JBOD. Just set the mode via jumpers on the board and start installing your OS—you don't even need to install F6 drivers! By default, you're given RAID 1, which Asus calls "EZ Backup." As a safety feature, the board won't change RAID modes even if you change the jumpers by accident, until you approve it in the BIOS.

The expansion-slot layout is PCI friendly. If you run two dual-slot CrossFire cards (nVidia doesn't allow SLI on the Intel chipset), you can still run two PCI cards. This is great for today's hardware, but what if the graphics-card manufacturer's plans to use a third PCI-E graphics card for physics pans out? You're out of luck with the P5W DH's config. Another ding is more against the chipset. When running two graphics cards in CrossFire mode, the board limits both cards to x8 modes. In today's games, the bandwidth gap shouldn't make much difference, but why not support dual x16s? Bueller? Intel? Anyone?

The board includes Asus' excellent overclocking capability (we took our 2.66GHz proc to 3.2GHz without breaking a sweat) and tons of BIOS options.

—GORDON MAH UNG

ASUS P5W DH DELUXE

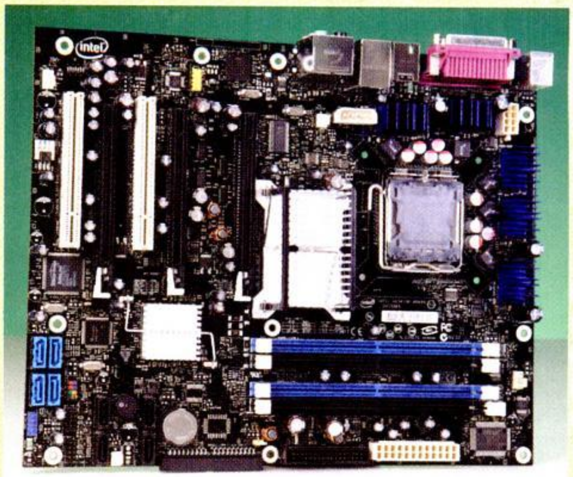
$280, www.asus.com

9

MAXIMUM PC KICKASS

Intel D975XBX

A solid choice for overclockers



Intel's D975XBX will be the yardstick we use to measure all Core 2 boards.

We admit that we haven't given Intel's motherboard division enough props lately. But that's because, short of Intel making Athlon 64-based motherboards, there hasn't been a reason to own an Intel board for the last two years.

With Core 2 CPUs now *the* chips to own, the D975XBX "Bad aXe" is suddenly a compelling option. The board was originally introduced with the dual-core Presler CPUs last year, but one thing is new: support for Core 2 chips. Only D975XBX boards with Altered Assembly codes (fancy-speak for board versions) of 304 will work with Core 2's lower voltage requirements. Fortunately, Intel says it has been shipping Core 2-ready versions of the board for months, so you should expect a plentiful supply of 304 versions on store shelves.

The D975XBX sports some pretty interesting features—including three physical x16 slots, which will allow you to run dual graphics cards plus a third card for physics support. The two graphics cards will run at just x8 speeds, but honestly, we haven't seen a significant performance boost yet from running dual cards at x16. Of course, because this is an Intel board, you can only run ATI's CrossFire cards—Nvidia hasn't given Intel's chipsets its dual-GPU blessings. That leaves Intel and the 975X chipset in a tough spot. What if ATI took its ball home and stopped supporting Intel chipsets for CrossFire?

In performance, we didn't see the D975XBX run away from the two P965-based boards, but it performed well. Still, we expected more from an "enthusiast" chipset.

The board is certainly able to overclock, however. Although the BIOS' OC options are confusing, many of the Internet overclocking records for Pentium D and Core 2 chips were set using the D975XBX. That makes it a great board for those overclocking aspirants who want the warm and fuzzy embrace of the Intel name behind their motherboard.

INTEL D975XBX

$275, www.intel.com

9

Foxconn C51XEM2AA

The new home of your new Athlon 64 CPU?

If you want to judge nVidia's vision for the new AM2 nForce 590 SLI chipset, look no further than Foxconn's C51XEM2AA. This motherboard is the closest you'll get to nVidia's concept design. In fact, nVidia even wrote the BIOS for this board.

Given this cozy relationship, it's no surprise that the C51XEM2AA supports every new feature of the nForce 590 SLI chipset, including *nTune 5,* which lets you tweak the system from the OS.

The board's overall layout is accommodating except for three gaffes. One mistake is admittedly minor: The LED for POST codes is partially obscured if you run SLI. Far more annoying is the fact that Foxconn placed key components too close together. The RAM slots are so near to the CPU that the heat spreaders on Corsair's SLI-Ready RAM almost touch a standard AVC heatsink. Not good. Also, the green south-bridge fan is dangerously close to the PCI-E retention clip—unless you have carnival-freakshow fingers, you won't be able to remove the graphics card without pulling the whole board out of your PC. Or you can just break off the retention clip completely.

There's plenty of hardware goodness to make up for bloopers, however. We like the four additional LEDs, which indicate which of the PSU's power rails are hot. Inclusion of FireWire B is also a nice touch. Furthermore, Foxconn includes an onboard speaker as well as onboard power-on and reset buttons—all desirable features. And we like that the C51XEM2AA SATA ports are intelligently laid out so you can use all of them easily.

The most exciting aspect of the C51XEM2AA is the highly tweakable BIOS, which is sure to have people scouring the Internet trying to figure out what all the features do. Even if you're not into manually adjusting every option for your overclock, the C51XEM2AA supports Corsair's SLI-Ready RAM, which is intended to provide automatic overclocking of the CPU and RAM.

nVidia worked closely with Foxconn on its nForce 590 board, even writing the board's BIOS.

FOXCONN C51XEM2AA

$250, www.foxconnchannel.com

9

Gigabyte GA-M59SLI-S5

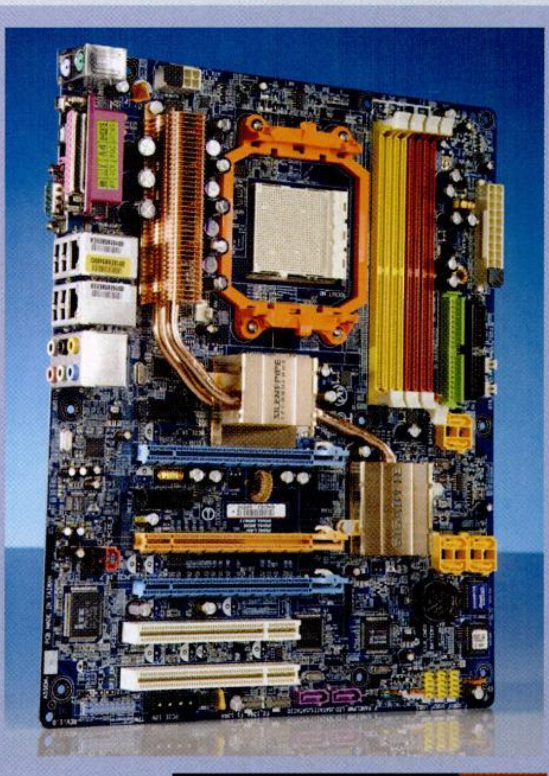
Is a third GPU in your future?

In a world of "me-too" motherboards, Gigabyte is known for its "not-me" risky moves. The company was the first to integrate two GeForce 6800 GPUs onto a single card, and it was the first to make dual BIOSes standard. While the GA-M59SLI-S5 isn't as outside-the-box as previous boards, Gigabyte does include three x16 PCI Express slots (two perform at x16 speed, one runs at x8 speed), a much-improved videocard retention-clip system, and a SATA-to-eSATA adapter.

The board uses nVidia's nForce 590 SLI chipset and includes a big chunky heat pipe to cool it. We usually dig fanless heat pipes, but this one prevents you from installing long PCI-E cards in one of the x1 slots. SATA-port placement is more logical, though: All eight ports are easily accessible, even in an SLI rig.

Given the same test components and memory configs, we didn't expect the Gigabyte board to outpace the MSI. But the Gigabyte did manage to pull ahead in our low-resolution *Quake III* test, which stresses CPU, chipset, and memory performance. Oddly, the Gigabyte board lagged in the synthetic *SiSoft Sandra* memory test. The oddity didn't appear to affect any other benchmarks, however.

Where this board really shines is in features. When compared with the two 590 boards we looked at in the September issue of Maximum PC, we think the Gigabyte pulls ahead of the pack by offering eSATA and a third x16 PCI-E slot.



Gigabyte's GA-M59SLI-S5 is the first AM2 board we've seen that can support a third GPU.

GIGABYTE GA-M59SLI-S5

$200, www.gigabyte-usa.com

9

FORGE YOUR

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Videocard Buyer's Guide

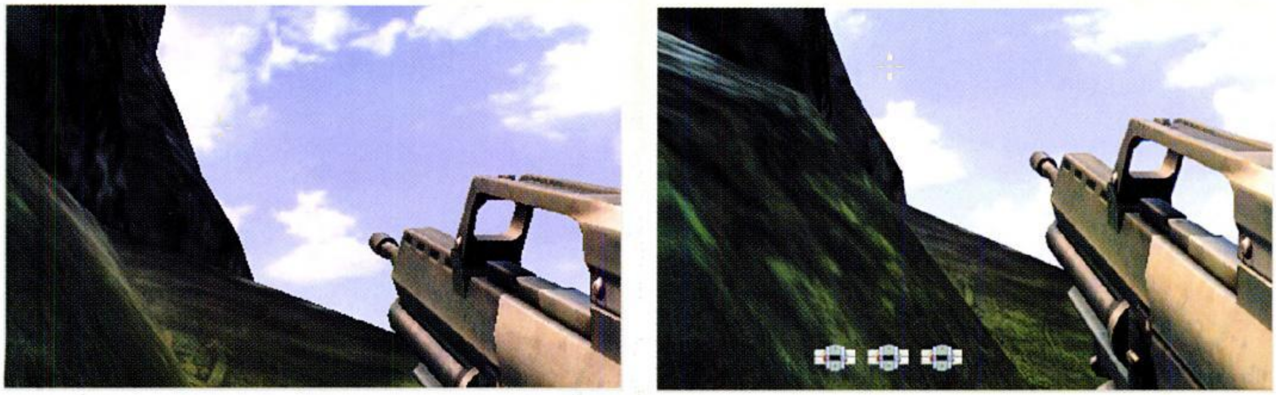
You've got graphics questions, we've got graphics answers

Two events shake up the videocard market and have a significant impact on the PC industry as a whole: The introduction of a new GPU architecture, and the release of a new version of DirectX. But things really get exciting when both developments occur in the same timeframe, and that's just what's about to happen.

Nvidia introduced its next-gen graphics processor, the GeForce 8800, in November. In addition to being a super-fast Direct3D 9.0 part, this is the industry's first PC graphics processor to feature a unified shader architecture. The concept of a unified shader architecture does away with the notion of having dedicated processors for executing vertex-shader code (geometry, essentially) and pixel-shader code. In a unified architecture, every processor unit is capable of executing any type of shader code. Microsoft, meanwhile, is on the verge of shipping Windows Vista, which will contain an entirely new version of DirectX. The only way to get DirectX 10 is through Windows Vista, and the only way to enjoy all the juicy visual benefits of DirectX 10 is with a brand-spankin' new videocard that specifically supports Direct3D 10. (That doesn't mean, however, that you need a DX 10 videocard in order to run Vista. Most DX9 cards will do just fine.)

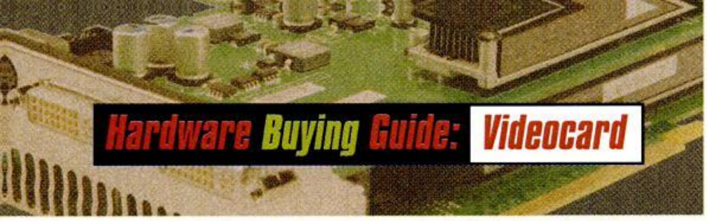
ATI has yet to announce its next move, but it would be a mistake to count the company out at this early stage of the race. They might have fumbled the introduction of both their Radeon X1000 series and their CrossFire dual-videocard solution, but they've made dramatic improvements to both technologies since then. And their recent acquisition by AMD provides them with important new intellectual, financial, and manufacturing resources. Nvidia is certainly entitled to bragging rights for being the first to produce a DX10 part, but the company's management is foolish if they're not looking over their shoulder to see what the competition is doing.

Cards based on Nvidia's new parts aren't cheap. At press time, they ranged from $450 to more than $600. What's a gamer with a limited budget and a crappy old videocard to do? If you can no longer get by with whatever you have now, we'd recommend buying something



The image on the left does not have AA enabled, note the ugly jaggies. The screen on the right has 8x AA enabled: Jaggies be gone!

Continued on page 26→



Continued from page 25→

in the $200 range. There are some real bargains to be had in this price category right now, with cards based on ATI's Radeon X1950 Pro and Nvidia's GeForce 7900 GTS being the lead contenders. Neither of these cards is compatible with DirectX 10, but no game developer in their right mind is going to release a game that won't work with DirectX 9 hardware.

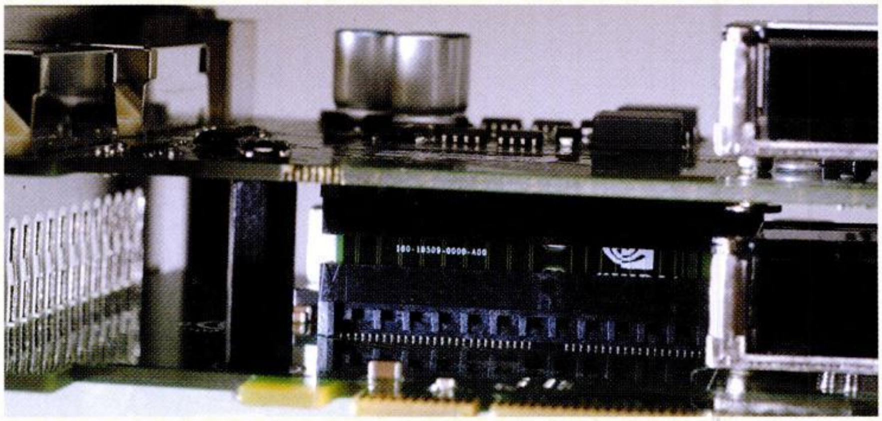
VIDEOCARD BUZZWORDS

Anyone entering the market for a new videocard should be familiar with these terms and new technologies.

ANTIALIASING: Video monitors have a difficult time displaying angled and curved lines; it doesn't matter whether your display is analog or digital, CRT or LCD, you're going to see jaggies unless your videocard does a good job of antialiasing. The algorithms that perform AA work are GPU-intensive, so you'll need to find the right balance of resolution, level of antialiasing (2x, 4x, 8x, or higher), and other features, such as high dynamic-range lighting. Most cards can't deliver 100-percent of eye candy and high frame rates, too.

ANISOTRPIC FILTERING: The textures applied to three-dimensional services that extend from the camera's perspective into the horizon will look fuzzy and out of proportion unless the GPU performs at least some level anisotropic filtering. When you boost the level of anisotropic filtering, you amplify the number of texture samples that are applied to each pixel in the texture. A 4x aniso setting will use 32 texture samples per pixel, for example. The higher the setting, the more accurate and pleasing to the eye the texture rendering will be.

H.264: This is a high-compression variant of the MPEG-4 video codec that has become very popular due to its ability to enable the streaming of high-definition video not only from a hard drive or optical disk (e.g., Blu-ray and HD-DVD), but also over a network or even multimedia telephone services.



HDMI: This is a newer type of cable connection that's capable of carrying both digital video *and* audio. Today, the video signal that emerges is essentially the same as what emerges from a DVI cable, so if you monitor supports HDMI, but your card supports only DVI, you can connect the two using an adapter or a cable with an HDMI connector at one end and a DVI connector at the other. We expect to see DVI fall by the wayside eventually, but predict it will be some time before that actually happens.

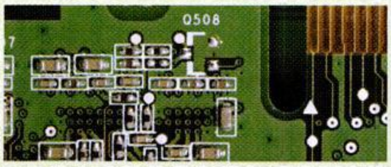
HDR LIGHTING: High dynamic-range lighting is a relatively new technology in the PC videocard market, and it makes games look significantly more visually interesting and realistic. Nvidia's 6- and 7-series cards can't deliver HDR lighting and antialiasing at the same time; ATI's X1000 series can, but with a performance hit. Nvidia's new 8800 cards can—and a whole lot more.

[lostcoast1, lostcoast2.bmp] HDR lighting results in a much higher level of in-game eye candy, such as in Half-Life 2's Loast Coast.

HDTV SUPPORT: If you intend to install a Blu-ray or HD-DVD drive in your PC with the intent of watching Hollywood movies, make sure your videocard—and your monitor, too—is outfitted with an HDCP decryption ROM. Just about any modern videocard is capable of rendering digital video at 1080 resolution, but only HDCP-compatible cards can be coupled with a Blu-ray or HD-DVD drive and next-gen movies.

UNIFIED ARCHITECTURE: Pre-DirectX 10 videocards are based on GPUs outfitted with dedicated computational units for processing vertex- or pixel-shader code. ATI's Radeon X1950 XTX, for instance, has 48 pixel-shader units and 8 vertex-shader units. The drawback to this design is that if the GPU is tasked with a vertex-intensive set of instructions, its pixel-shader units sit idle. In the unified architecture envisioned by DirectX 10, any of the GPU's computational units can process *any* shader instruction: vertex, pixel, or the entirely new category of geometry shading. This way, none of the GPU's computational units are ever left with nothing to do.

VIVO: The acronym stands for video-in/video-out, and it refers to a videocard's ability to both digitize analog video in real time (from an analog VCR or camcorder, for instance, so you can edit it on your PC) and output analog video (so you can display it on a television monitor).



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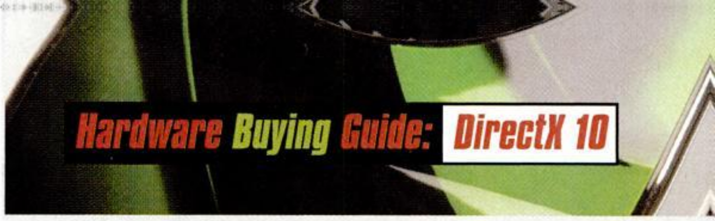
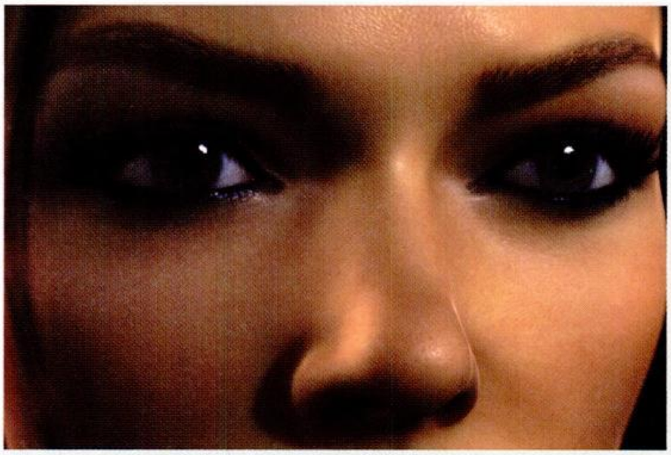


DirectX 10 Is Coming!

Windows Vista will bring big changes to the videocard market.

Microsoft has completely rewritten the crucially important collection of application program interfaces known as DirectX. In a major departure, the company has thrown the concept of backward compatibility out the window—and we couldn't be more pleased. By writing DirectX 10 from the ground up, videocard manufacturers and game developers will be freed from the shackles of looking backward and writing convoluted code to support old hardware that most of us would rather forget anyway. (For more on DirectX 10, and Direct3D 10, see story on page 66.)

DirectX 10 will be the underlying video architecture for Windows Vista; in fact, it's so tightly integrated with Vista that it won't be compatible with earlier versions of the Windows OS—not even Windows XP. DirectX 10 also won't run on any previous-generation videocards. As we were going to press, the only videocards we know it *will* run on are those based on Nvidia's GeForce 8800 GTX and GeForce 8800 GTS. We know ATI is working feverishly on its next-gen part, but they weren't ready to talk to the press about anything just yet. Nvidia's new hardware is here though, so let's talk about that.



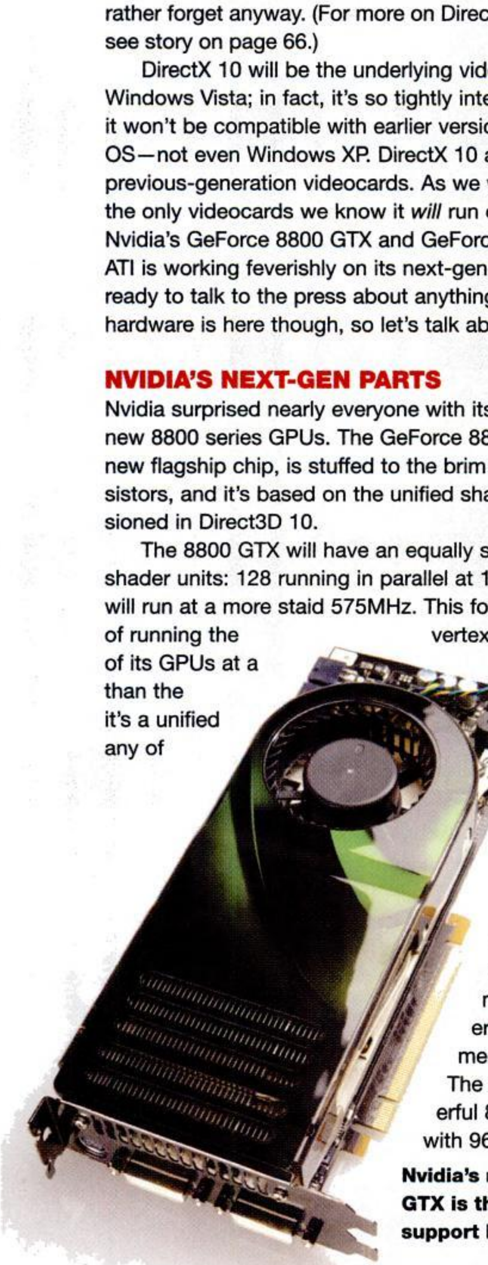
The combination of Direct3D 10's Shader Model 4.0 and the incredible horsepower of DX10-compatible graphics processors such as Nvidia's GeForce 8800 will bring incredibly realistic characters to next-gen games.

NVIDIA'S NEXT-GEN PARTS

Nvidia surprised nearly everyone with its announcement of its new 8800 series GPUs. The GeForce 8800 GTX, the company's new flagship chip, is stuffed to the brim with 681 million transistors, and it's based on the unified shader architecture envisioned in Direct3D 10.

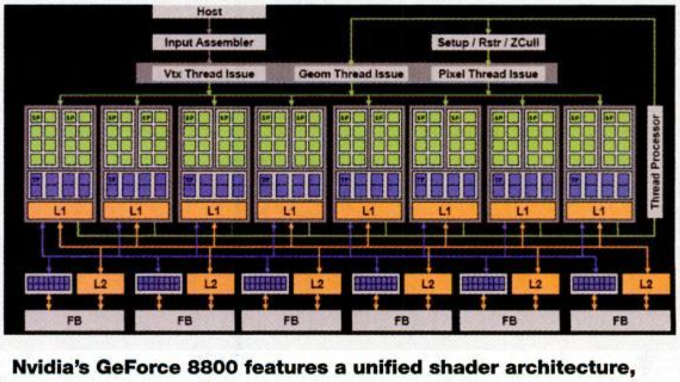
The 8800 GTX will have an equally staggering number of shader units: 128 running in parallel at 1.35GHz (the GPU core will run at a more staid 575MHz. This follows Nvidia's practice of running the vertex-shader units on many of its GPUs at a higher frequency than the cores.) Since it's a unified architecture, any of these 128 shader units can execute any of the three types of shader code: Vertex, geometry, or pixel.

The chip has a 384-bit interface to 768MB of GDDR3 memory on Nvidia's reference-design cards. The memory runs at 900MHz. The only slightly less-powerful 8800 GTS is outfitted with 96 parallel shader units clocked at 1.2GHz (500MHz core). Reference-design cards have 640MB of GDDR3 memory clocked at 800MHz, communicating with the GPU through a 320-bit interface.



Nvidia's new GeForce 8800 GTX is the first GPU to fully support DirectX 10.

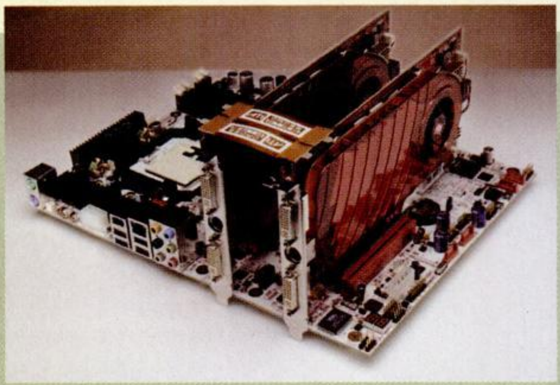
Despite the huge transistor count, reference-design videocards based on the 8800 GTX draw only 185 watts of power. If you're running two of these monsters in SLI, of course, you'll need an equally monstrous power supply; but that's not much different than today's SLI power-supply requirements. Speaking of monstrous, prepare for a case of sticker shock when you go shopping: 8800 GTX cards are expected to fetch $600 a piece; the ever-so-slightly more affordable 8800 GTS will go for $450. With ATI temporarily out of the picture, gamers shouldn't expect to find much in the way of competitive discounts during the early lifespan of these new parts.



Nvidia's GeForce 8800 features a unified shader architecture, meaning any of its 128 shader units is capable of executing either vertex, shader, or geometry instructions.

ATI Radeon X1950 Pro

Finally, a dongle-free CrossFire!



ATI has finally come up with a CrossFire solution we can recommend without hesitation: You connect a pair of X1950 Pros *inside* the case.

ATI has built a better dual-videocard mousetrap—and it's cheap! In spite of our enthusiasm, however, we can't give the Radeon X1950 Pro a higher rating because we're so close to the debut of Direct3D 10 (see story, page 29)—which this card doesn't support. We've dinged Nvidia's latest cards on the same grounds.

We've had many reasons to like CrossFire: Its "super antialiasing" is a terrific solution that doesn't have to be shut off while performing high dynamic-range lighting, for one. Unfortunately for ATI, those benefits have been eclipsed by a kludgey cabling system and noisy cooling apparatus. Such drawbacks disappear with the X1950 Pro.

CrossFire has always depended on a master/slave relationship because the compositing circuitry that weaves the images from the two cards into a coherent whole was located on a separate chip on the CrossFire master card. That circuitry is now integrated into the X1950 Pro GPU, much like it is with Nvidia's parts. To build a CrossFire rig, you simply need two X1950 Pro's—the master/slave arrangement is gone.

The new GPU also does away with the bulky external cable. Each card has two edge connectors to accommodate a pair of internal ribbon cables. Why two? Each connection is capable of transferring 12 bits of graphics data, which enables two X1950 Pro cards running in CrossFire to deliver up to 2560x2048 resolution at 60Hz (Nvidia's 7-series GPUs max out at 2560x1600).

The card supports HDCP, too, so you can play back Hollywood movies on a Blu-ray or HD-DVD drive. If you're more interested in *making* movies, ATI's reference design includes video-in as well as video-out.

The single-slot card is long—a full nine inches. A contiguous copper heatsink stretches across the entire surface of one side, with a fan at the far end. Unlike the X1950 XTX, warm air is exhausted through the fan's hub, instead of being evacuated outside the case.

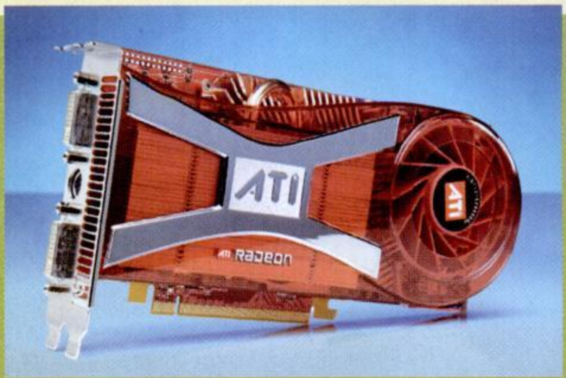
If you can't wait for Direct3D 10 parts, and games are the only reason you're buying a new videocard, we recommend something with Nvidia's 7900 GS in this price range. But we rate ATI's X1950 Pro a notch higher because its support for ultra-high resolution and its VIVO feature render it a better all-around value.

—MICHAEL BROWN

ATI RADEON X1950 PRO
$200, www.ati.com
8

ATI X1950 XTX

Meet the new king of the single-GPU hill



ATI's new X1950 XTX is certainly fast, and it's unique in offering 1GHz, GDDR4 memory, but we just can't make a "buy" recommendation on a high-end videocard that's soon to be rendered obsolete by DirectX 10.

The PC market is an unforgiving, what-have-you-done-for-me-lately place, as ATI is well aware: The company's been playing second fiddle to nVidia for almost two years now. Still, ATI has introduced its share of innovations—Avivo, 512MB frame buffers, and 48 pixel shaders among them—and now it *finally* has the fastest single-GPU videocard.

It's important to note, however, the distinction between a single-GPU videocard and a single videocard. nVidia's dual-GPU GeForce 7950 GX2 remains the performance leader in the latter category; but the X1950 XTX is no slouch. This is the first consumer videocard to feature 512MB of GDDR4 RAM, clocked at a blistering 1GHz. Good thing, too, because the GPU, which ATI has dubbed the R580+, is not radically different from the X1900 XTX: It has the same number of pixel shaders (48), the same number of vertex shaders (8), and the same core clock speed (650MHz).

The fan on ATI's X1900 XTX is loud enough to wake the dead, so ATI wisely adopted a new cooling design—one that's very similar to HIS' IceQ Radeons—for the X1950 XTX: a ginormous copper heatsink covering the GPU and memory, and a very large fan (7.25cm) mounted far back on the card. The X1950 XTX GPU still runs considerably warmer than nVidia's GeForce 7900 GTX—by about 15 C under load—but thanks to this new cooling design, the card produces very little fan noise: It's easily as quiet as nVidia's 7900 GTX.

ATI is proud of the fact that its X1000 cards can perform high dynamic-range lighting and antialiasing at the same time—nVidia's cards can't. But the value of such a feature is diminished by the performance hit the card takes to deliver it. Turning on 4x AA in our *3DMark06* HDR tests resulted in a 19 percent reduction in frame rate in Game 1, and a 38 percent drop in Game 2.

So, the X1950 XTX is the fastest single-GPU card out there. Should you drop four and a half bills on one? Frankly, it's tough for us to recommend dropping that kind of green on *any* DirectX 9 videocard right now, simply because DirectX 10 is waiting in the wings. Think of it this way: If you buy this card today, and DX10 comes out as late as April 2007, will it have delivered $100 per month of value by then?

—MICHAEL BROWN

ATI RADEON X1950 XTX
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Continued on page 33→

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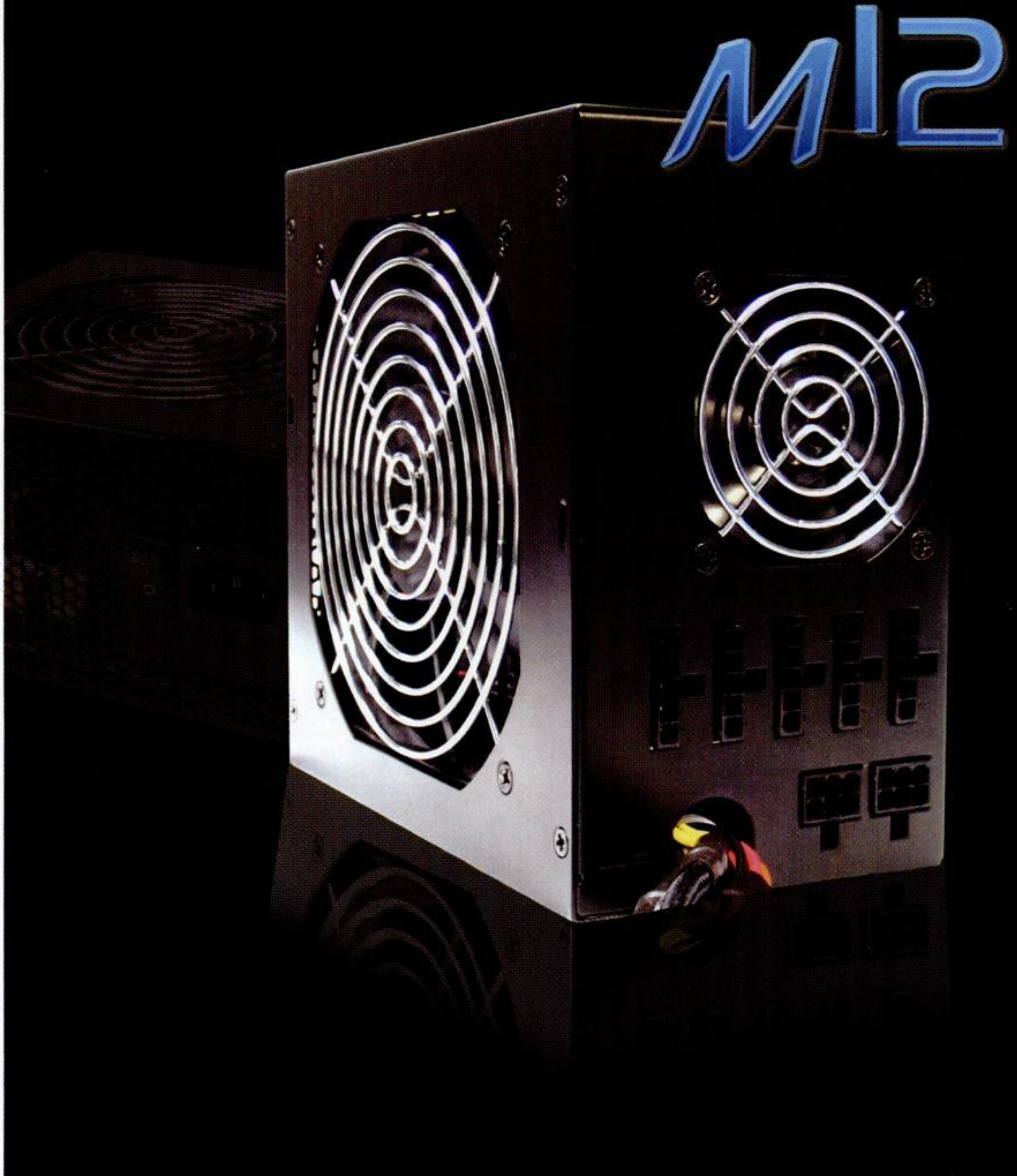

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Continued from page 30

XFX GEFORCE 7900 GTX

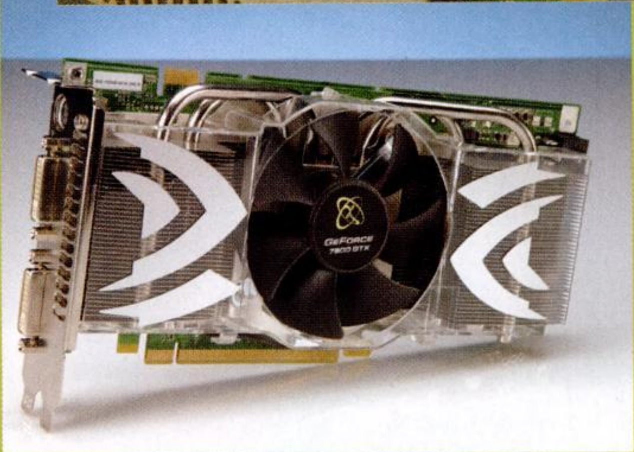
Speedy videocard—and lofty price tag

We tapped another Asus motherboard for our new nForce4-powered test bed: the A8N32-SLI Deluxe. But let's pick up our coverage of XFX's side of the fight where we left off with Sapphire's: In a surprising turn of events, nVidia's terrible twins got their asses handed to them when we pitted SLI against CrossFire in *Quake 4* at Ultra Quality. If that's the only game you ever intend to play, and you've got the bucks for a pair of Sapphire's best, go for it. But wouldn't that be akin to attending a lavish banquet and limiting yourself to the Beef Wellington?

As the tale of the tape tells, you'd be missing plenty: We tested XFX's overclocked GeForce 7900 GTX implementation (model PV-T71F-YDD9), which has a 700MHz core and 512MB of memory blazing along at 900MHz. This monster rolled over and flattened its X1900 XTX-powered competitor in both single- and dual-GPU modes. In single-card mode, XFX beat Sapphire by 18 percent playing *FEAR*, by 9 percent in *Call of Duty 2*, and by 14 percent in *Quake* at High Quality (it was a tie at Ultra Quality).

True, ATI's chip delivers prettier graphics and video, but you must disable CrossFire to watch a movie. SLI has no such limitation; besides, our tests revealed SLI to be generally faster—by wide margins: a 26 percent edge in *FEAR*, 24 percent faster in *Call of Duty 2*, and 10 percent quicker in *Quake 4* at High Quality.

If you really don't care about games, ATI has the better solution. But non-gamers don't need to spring for the top-drawer GPU to get Avivo functionality—any card in the X1000 line will likely suit your needs.



XFX has five different versions of nVidia's GeForce 7900 GTX; make sure you know what you're bringing home.

XFX GEFORCE 7900 GTX
$590, www.xfxforce.com
9
MAXIMUM PC KICKASS

eVGA e-GeForce 7900 GT CO Superclocked

Meet a midrange monster

Can't afford a top-shelf videocard like the screamin' XFX model reviewed on page 72? Take comfort in the knowledge that eVGA has an impressively overclocked version of the only slightly less powerful GeForce 7900 GT: Its $360 street price is $230 lower than the aforementioned 7900 GTX card.

eVGA's main contribution was to factory-overclock the GPU and memory, from 450- and 660MHz, respectively, to 550MHz for the core and 790MHz for the 256MB of GDDR3 memory. But nVidia also deserves a share of the credit for this card's performance. Unlike the 7800 GT, which achieved its cost savings by lopping off four pipes and one vertex shader, the 7900 GT has a full complement of 24 pixel pipelines and eight vertex shaders—just like its more costly cousins, the 7800 and 7900 GTXs.

As a result, you don't need to sacrifice eye candy in the name of frame rate. Just take a look at the benchmark charts: Running *Quake 4* in High Quality mode, with 4x antialiasing, 8x anisotropic filtering, and resolution ratcheted up to 1600x1200, a single card mustered an impressive 59.6 frames per second. The card was even more impressive in our *FEAR* benchmark: At the same resolution, but with soft shadows turned on and AA turned off (a bug in the game dictates enabling one or the other, but not both), eVGA's card came within one frame per second of matching the much more expensive Sapphire Radeon X1900 XTX.

Things get even more exciting when you bring SLI into the picture. The two cards scaled well running in our new Asus A8N32-SLI Deluxe motherboard, which allows both PCI Express slots to operate in x16 mode: We saw a 60 percent boost in performance running our *Call of Duty 2* benchmark. This is one midrange card we expect to see on our on Best of the Best list for a while.

—MICHAEL BROWN

eVGA gets aggressive with the GeForce 7900 GT's core and memory clocks.

EVGA GEFORCE 7900 GT
$360, www.evga.com
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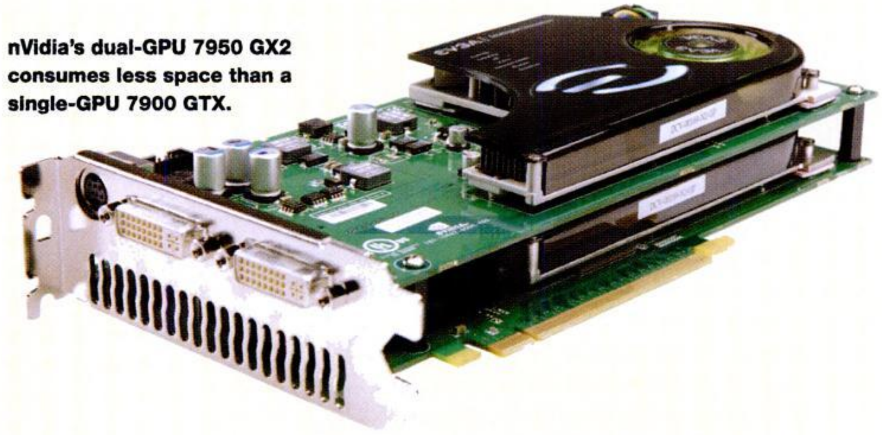
Multiple GPU Configurations

For folks with a particularly hearty appetite for graphics, ATI and nVidia serve up double portions of videocard power: SLI, the GeForce 7950 GX2, and CrossFire deliver twice as many GPUs and twice as much memory

As displays get larger and games become ever more graphically intense, the demands placed on your graphics card increase. And there's no more cost-effective way to boost your graphics horsepower than by plugging in a second GPU to handle the workload.

It won't always make economic sense to jump straight into dual-GPU mode. If you're shopping for an nVidia card, for instance, it would make more sense to buy one GeForce 7900 GT than two GeForce 7600 GTs. You'd get the same performance for the same price, but you'd be able to upgrade down the line with a second 7900 GT.

Until now, the one drawback to both ATI's and nVidia's dual-GPU solutions has been that CrossFire and SLI require a motherboard powered by an ATI or nVidia chipset, respectively. nVidia is changing that with its new GeForce 7950 GX2 card, which we'll also discuss here. But first, let's take a look at what ATI has to offer.



nVidia's dual-GPU 7950 GX2 consumes less space than a single-GPU 7900 GTX.

THE T-BONE: ATI CROSSFIRE

ATI's dual-GPU system couldn't be more different than nVidia's, at least not at the high end of the performance scale. If you're building CrossFire with an X1800 XL or XT, you'll need to pair it with an X1800 CrossFire Edition master card; likewise, creating a CrossFire system based on the X1900 GT, XT, or XTX requires an X1900 CrossFire Edition master card. When the slave card has finished its rendering task, it transfers the data over an external cable to the master card. A compositing chip on the master card combines this information with its own to create the finished frame.

CrossFire systems based on anything else in ATI's lineup, from the X1800 GTO on down, don't need a master card or the external cable; the PCI Express bus is capable of handling the data exchange.

ATI's CrossFire solution just can't touch nVidia's SLI.

THE PORTERHOUSE: NVIDIA SLI

nVidia cards don't need a master card because each GeForce 6- and 7-series GPU has a compositing engine baked right in. Higher-end cards (GeForce 6600 GT and up) require an internal SLI connector, because the PCI Express bus can't handle the traffic.

Any GeForce 6- or 7- series card can be paired, regardless of memory or core clock speeds, as long as both cards have the same GPU and the same-size frame buffers. SLI is such a well-designed solution for increasing graphics horsepower that it's even beginning to show up in notebook computers.

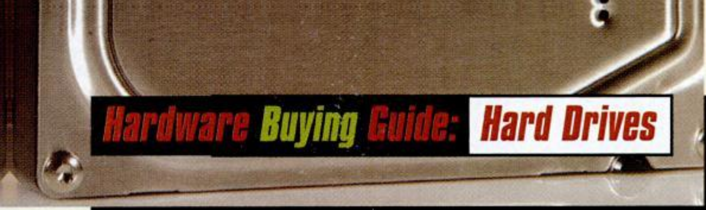
THE STUFFED CHOP: GEFORCE 7950 GX2

nVidia's brand-new GeForce 7950 GX2 packs two 7900-class GPUs and two 512MB frame buffers into a package that's thinner than a single 7900 GTX card. What's more, it brings SLI performance to any PCI Express-compliant motherboard—there's no need for an nForce chipset.

The 7950 GX2 delivered significantly faster benchmark results than any other single-slot graphics solution we tested. When compared with other nVidia reference designs, it was slightly faster than two 7900 GTs running in SLI, but significantly slower than a pair of 7900 GTXs.

All three GPUs feature 24 pixel-shader units and eight vertex-shader units, but the 7950's 500MHz core clock speed is well below that of the 650MHz 7900 GTX, and it's only slightly faster than the 450MHz 7900 GT. Its 512MB frame buffer is twice the size of the 7900 GT, but its stock memory clock runs 60MHz slower than the GT and a full 200MHz slower than the 512MB of memory on the 7900 GTX.

It stands to reason that if two are better, four must be incredible. And nVidia's latest drivers do support end-user quad-SLI configurations. However, for the moment, the performance increases we're seeing in the lab do not justify the expense, interior case real estate, power consumption, and heat generation (Unless you have an extremely large display).



How to Buy a Hard Drive

Do you really need to spring for 10,000rpms?

Hard drives have improved by leaps and bounds in the last few years, and while a super-fast drive won't improve your frame rate at all, it can certainly help levels load faster and provide more than enough space for all your games, MP3s, and more. The most important features to consider when shopping for a gaming drive are buffer size, storage capacity, and rotational speed.

BUFFER: Every hard drive has a tiny bit of onboard memory that is known as the buffer, or cache. When data is retrieved from the platters it is put into the cache so that if you close something that you just retrieved (say, a Word document) and then you suddenly decide you need to open it again, the document can be read directly from the cache. This saves the drive's read/write heads from needing to go all the way back to where the file was on the platter to read it again. It also saves a lot of time, as data can be retrieved from memory almost instantly. A general rule with buffer size is the bigger, the better. Today's minimum is 8MB, and several high-end drives now ship with 16MB buffers.

CAPACITY: As with cache, the general rule with capacity is the bigger, the better. Though everyone's size requirements are different, we find a safe rule of thumb is 250GB as the minimum for a high-end gaming machine. Drives are available today in sizes ranging from 80GB all the way up to 750GB, so it's generally true that drives in the 200GB-to-300GB range are in the "sweet spot" in terms of price and capacity. However, prices on the big boys are falling: When 500GB drives debuted last year, they cost $500 — now you can get them for less than $300.

INTERFACE: Two interfaces are available for hard drives, and there's not much difference between them in terms of performance, so when deciding which is right for you the primary consideration should be what type of ports your motherboard offers. The standard interface is called Parallel ATA (also known as ATA or Ultra ATA). This interface uses a 40-pin connector with wide, flat ribbon cables; has been around for quite some time now; and traditionally it has been found on all motherboards. However, the parallel interface is currently being phased out in favor of a newer, faster interface named Serial ATA, which uses thin cables. SATA's benefits include the fact that you don't have to set jumpers (which is required with ATA devices), and that its smaller cables don't inhibit airflow as much as the archaic ATA cables.

ROTATIONAL SPEED: Because hard drives operate by rotating a platter underneath a pair of read/write heads to retrieve data, the faster the platters spin, the less time you spend waiting for data to be retrieved. The most common rotational speed for consumer-level hard drives is 7,200rpm, which is the minimum you should accept in a gaming drive.

Western Digital Caviar SE16 500GB

The new half-terabyte champion

Western Digital's 400GB Caviar is already our favorite 7,200rpm drive, so we expected big things from its new 500GB successor—and we were mostly satisfied.

The drive runs on a SATA 3G interface, sports a 16MB buffer, and uses four 125GB platters. This gives it a substantial areal-density advantage over its 400GB baby brother, which uses four 100GB platters. In drive comparisons, if all other specs are the same, the drive with the higher areal density will always be faster, because the read/write heads can pick up more data with less movement. And, indeed, we see that the 500GB drive has faster read speeds than the 400GB drive, while the performance of the two is essentially equal in all other benchmarks.

The 500GB Western Digital drive set a new benchmark record in *HD Tach,* with an amazing 62MB/s average read speed across its platters. However, it only equaled the 400GB version in all of our other "real world" benchmarks, which was a bit puzzling. Still, the fact that it performs as well as the fastest drive around and offers more capacity makes it good enough for us.

—JOSH NOREM

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Continued on page 39→

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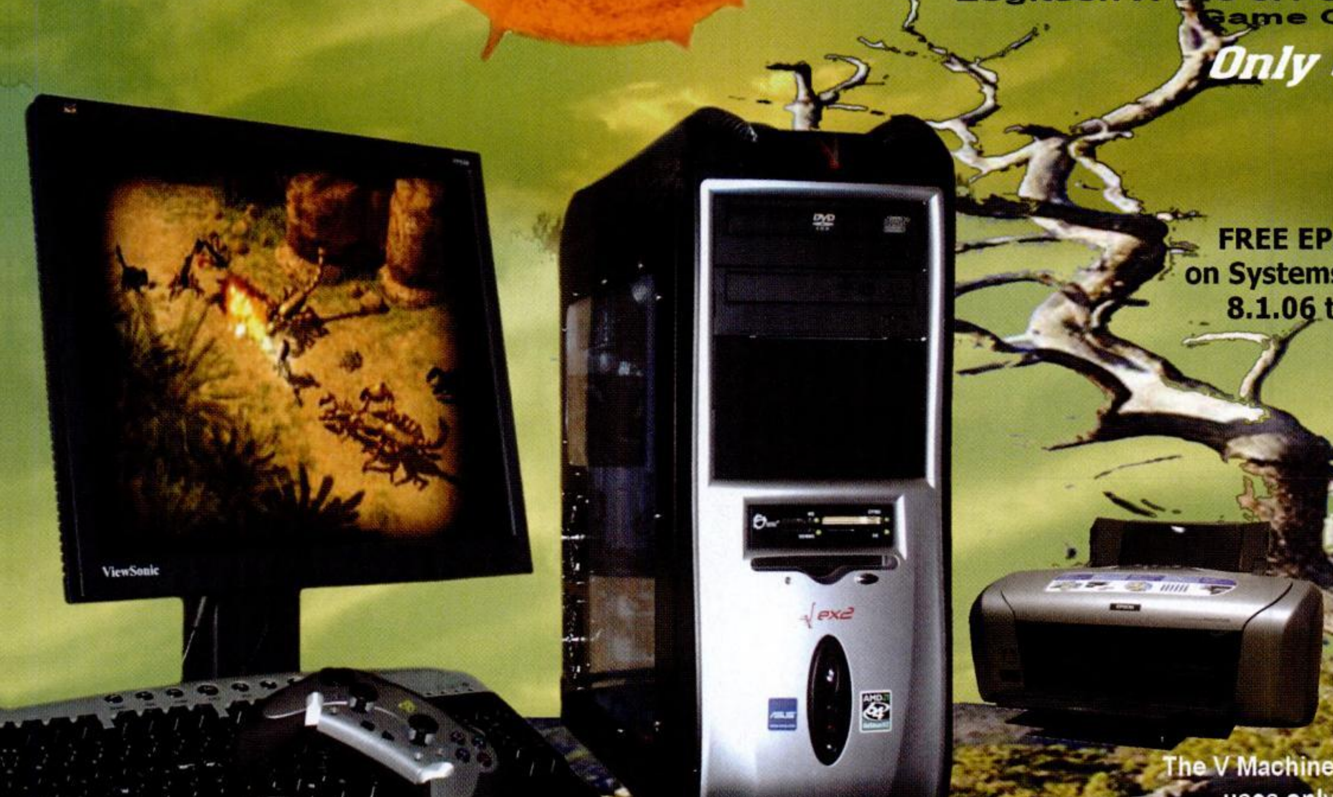

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Continued from page 36

Samsung HD400LJ

Get 400 gigs on the cheap

Even though Seagate's behemoth 750GB Barracuda is getting all the love from the media these days, most people can't afford a drive that spacious. The sweet spot is still at 300-400GB drives, but even those prices fluctuate. Enter the SpinPoint HD400LJ—a drive that offers both ample room and extreme affordability.

Although it sports a measly (by today's standards) 8MB buffer, the 400GB SpinPoint ran amazingly fast in our sequential read speed test, besting nearly every 7,200rpm drive we've ever tested. Its read speed of 61MB/s outpaces even the mighty WD4000KD, running neck-and-neck with that drive's big brother, the WD5000KS. The SpinPoint is not as fast as the 750GB Seagate Barracuda, but that's not surprising—*nothing* is as fast as the big, bad 'Cuda.

BENCHMARKS

	SAMSUNG
HD TACH 3	
RANDOM ACCESS TIME (MS)	15.4
BURST RATE (MB/S)	183
AVG. SEQUENTIAL READ (MB/S)	61.3
OTHER	
DOOM 3 LOADING (SEC)	31
5GB READ (SEC)	105
IOMETER 50 PERCENT RANDOM) WORKLOAD (IO/SEC	154
OPERATING TEMP WITH NO FAN**	55

*Best scores are bolded. *The application index is a real-world script of six applications. The score is based on the time it takes the drive to complete the scripts. **Hard drive temperatures measured using S.M.A.R.T. data, as reported by the Speedfan utility.*

Aside from its stellar performance in the sequential read test, however, the SpinPoint delivered lackluster results in the rest of our benchmark suite. Its seek time of 15.4ms is surprisingly off-spec, and this helped it limp to a substandard score of 26.4 in our application index. The drive also scored poorly in our *IOmeter* test, but performed decently in real-world file-transfer tests.

Yes, the SpinPoint's performance falls short of first place, but it's not a terrible drive—and it has a few noteworthy things going for it. First, look at the price below (go ahead, we'll wait). Can you believe it? We searched our favorite price comparison engines, and couldn't find a less expensive 7,200rpm 400GB drive, anywhere. It's also one of the quietest drives we've ever tested. Even during seeks it's barely audible, and it makes no noise at all while idling.

In the final tally, the SpinPoint drive is a compromise. It delivers respectable performance and decent capacity, but it's no match for today's high-end 7,200rpm drives. While we'd never choose this drive over a faster performer, it's great for folks on a budget. We just wonder what Samsung could do if it paired this drive with a 16MB buffer.

—JOSH NOREM

We were surprised by Samsung's SpinPoint. It's competitive with offerings from WD and Seagate, and insanely affordable.

SAMSUNG SPINPOINT
$150, www.samsung.com
8

Seagate Barracuda 750GB

Meet the new 7,200rpm performance king

Big companies rarely take chances, and Seagate—the world's largest drive maker—is no exception. It has always played second fiddle to Hitachi when it comes to the 7,200rpm hard drive capacity war, and even though Seagate drives are reliable and semi-speedy, they've never delivered industry-leading or even outstanding performance. Well, those days are over. Seagate has shipped the world's first perpendicular desktop hard drive, which shatters the capacity record, and is also the fastest 7,200rpm drive we've ever tested.

BENCHMARKS

	BARRACUDA
HD TACH 3	
RANDOM ACCESS TIME (MS)	13.4
BURST RATE (MB/S)	256
AVG. SEQUENTIAL READ (MB/S)	66
H2BENCHW	
APPLICATION INDEX*	27.3
OTHER	
DOOM 3 LOADING (SEC)	28
5GB READ (SEC)	82
IOMETER 50 PERCENT RANDOM WORKLOAD (IO/SEC)	255
OPERATING TEMP WITH NO FAN**	53

*Best scores are bolded. *The application index is a real-world script of six applications. The score is based on the time it takes the drive to complete the scripts. **Hard drive temperatures measured using S.M.A.R.T. data, as reported by the Speedfan utility.*

The tenth-generation 7,200rpm (7200.10 for short) Barracuda drive pulls out all the stops. While the rest of the hard drive world is still using longitudinal recording, where the magnetized bits are laid down on the recording media in a flat orientation, Seagate has already moved to a new, more efficient way of packing bits onto platters. In perpendicular recording the bits "stand" up, so they are oriented perpendicular to the recording media. Perpendicular drives pack more bits on each platter, allowing for massive increases in capacity, as witnessed by this drive's unbelievable 750GB capacity (the next-biggest drive is a lowly 500GB).

The 7200.10 Barracuda sports a 16MB buffer, a SATA 3G interface, and four 187GB platters. During testing, the drive set benchmark records in several categories, including sequential read speed, *IOmeter*, a 5GB read, and *Doom 3* loading. This drive kicks serious ass across the board. Not since the Raptor's arrival have we seen such a hard drive smackdown. The speed doesn't come without a price, however; the drive ran nuclear hot under load without cooling, and its application index score was lower than the WD400KD. (It was higher than the newer WD500KS, which means it might be time to revisit this benchmark.)

Folks, there's a new 7,200rpm sheriff in town, and its name is Barracuda.

—JOSH NOREM

Seagate's 7200.10 Barracuda is the world's first desktop hard drive to take advantage of perpendicular recording technology.

BARRACUDA 750GB
$500, www.seagate.com
9
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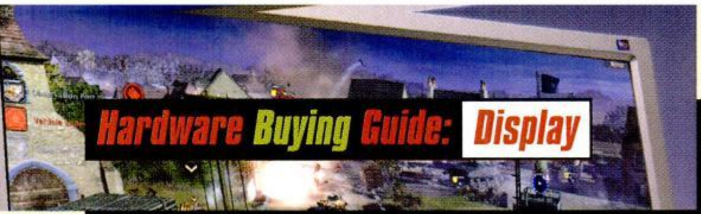

Pick the Perfect Display

Before you plunk down the cash for your next monitor, know which specs matter and which are bunk

SCREEN SIZE: This figure is the size of the LCD panel measured diagonally from corner to corner. Desktop screens range in size from 15 to 23 inches and beyond. We consider 19 inches the minimum for all-purpose computing. You need at least that much screen real estate to work in multiple windows comfortably, and to thoroughly enjoy high-definition video and PC games.

ASPECT RATIO: A display's aspect ratio is its screen width divided by its height. The majority of desktop monitors have an aspect ratio of 4:3, regardless of their screen size; and the majority of software applications and computer games are designed accordingly. This is something to bear in mind if you're considering a widescreen model, which typically has an aspect ratio of 16:9. If content, such as a game, insists on a 4:3 ratio, the display will stretch the content to fill the entire screen, making everything look fatter than it should. This situation is becoming less of a problem every day, as most games support at least one widescreen mode that won't look distorted.

NATIVE RESOLUTION: Every LCD sports a fixed number of pixels arrayed in a grid that is a certain number of pixels high and a certain number of pixels wide. The native resolution is the width of the display (in pixels) by the height (in pixels). The native resolution will deliver an optimum picture. While it's possible to run an LCD at a lower, non-native resolution, the image will be rescaled and the display will use interpolation to fill in the missing pixels, which can degrade image quality. Native resolution and interpolation quality are of particular concern to gamers, who often run games at low resolutions to get the best frame rate.

An LCD's native resolution is typically determined by its screen size. For example, many 19-inch monitors have a native resolution of 1280x1024, while many 20-inch models have a native resolution of 1600x1200. A higher resolution makes everything look smaller onscreen, but also gives you more space on your desktop.

INTERFACE: Today's LCDs connect to the graphics board via either an analog VGA connector or a digital DVI connector. If your graphics board is equipped with DVI outputs—most modern boards are—we recommend you use DVI to connect to your LCD.

Unlike CRTs, which must refresh every pixel on the screen 60-plus times a second, LCDs modify pixels only when they change. The analog connection is less precise because the digital information must be converted to an analog stream in order to travel to the LCD, where it is then analyzed and converted back to a digital format. This is a recipe for data loss or corruption in the image that is ultimately displayed on-screen.

CONTROLS: The degree to which you can adjust an LCD's picture via the onscreen display (OSD) varies among monitors: in some cases, you have fewer options with the digital interface because the manufacturer cheaped out. Adding hardware to the display that allows the user to manipulate the image detracts from the manufacturer's bottom line. We think it's important to have at least some control over color, brightness, and contrast.

PIXEL RESPONSE TIME: This spec has been getting a lot of play lately, so it deserves mention. A pixel's response time, measured in milliseconds, describes the time it takes for a pixel to change from its on state to its off state and then back on again. If the response time is too slow, you'll see ghosting and other artifacts because the display's pixels can't keep pace with the information sent from the graphics card. This problem is particularly noticeable in games, which tend to have fast action sequences.

A response time of 25 milliseconds was once the norm, but it's not uncommon these days to see response times listed in the single digits. As impressive as this spec sounds, it should be taken with a grain of salt. Different manufacturers report response times differently, so this spec isn't a reliable means of comparing different brands. Some vendors report only the pixels' rising (turning on) or falling (turning off) time; others report how long it takes for a pixel to turn on, turn off, and then turn on again; and still others report the time it takes for a pixel to go from peak white to full black. (Pixels change from white to black much faster than they change from gray to gray, but the latter is a much more common occurrence in real-world use.)

Because of this inconsistency, we don't normally report on a display's pixel response time, but we mention it here to illustrate a point: Response-time specs often do not jibe with qualitatively measured performance. The best way to determine an LCD's abilities with fast-paced content, in our opinion, is to eyeball it first-hand.

ERGONOMICS: Obviously, the more ability you have to adjust your screen's height, tilt, and orientation to fit your body, the better.

Continued on page 42

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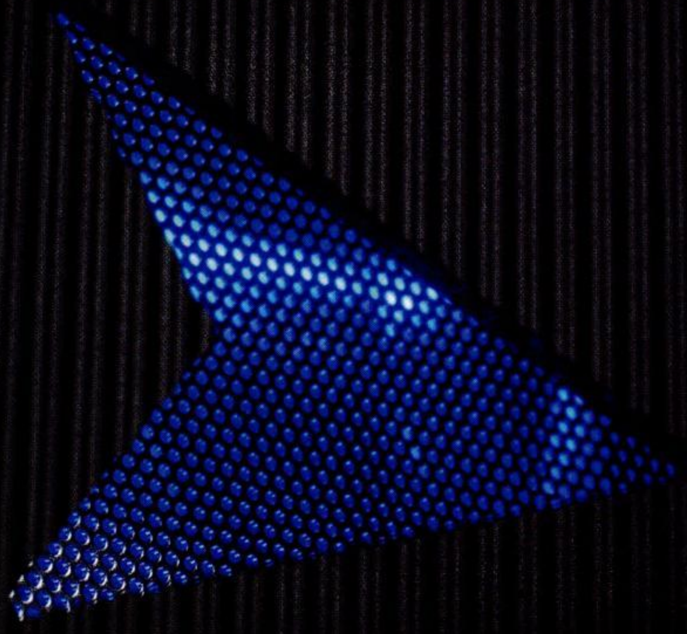

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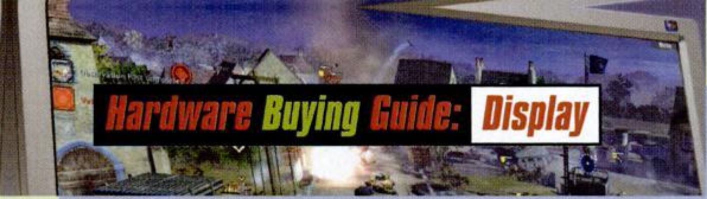


Continued from page 40

NEC 90GX2

The 90GX2's glossy, vibrant screen is known to stop passers-by in their tracks.

The first thing you notice about NEC's 90GX2 is its glossy screen. It stands in stark contrast to the Dell screen below, which is treated with anti-glare and anti-reflective coatings (as are the majority of LCD screens). These coatings give displays a flat, matte finish that doesn't reflect light. The benefit of NEC's so-called OptiClear technology is that the screen's high sheen intensifies colors and contrast, producing a much more brilliant, vivid picture. Of course, such a screen is not suited to all environments. In our Lab, for instance, the bright overhead fluorescent lights created distracting reflections on the 90GX2's mirror-like surface, and even in lower-light situations, you might notice ambient reflections in large swaths of dark color.

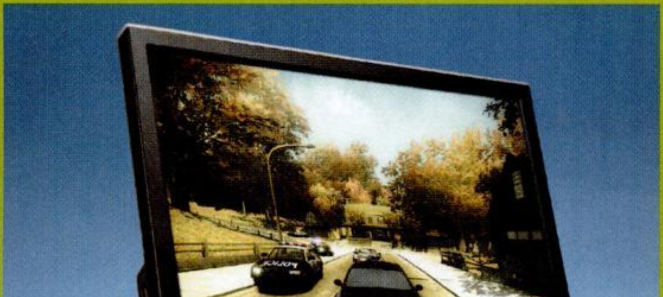
But this isn't likely to dampen most home users' appreciation of the screen's vibrancy. During our testing, the 90GX2 certainly stole the show in the entertainment and desktop applications. Games in particular had extraordinary visual panache, and the screen was free of any signs of ghosting during fast-motion sequences.

But the 90GX2 isn't flawless. The backlight is visible around the perimeter, especially on a primarily dark screen. And in *DisplayMate* we observed subtle color-tracking errors in grayscales of 64 steps or more (characterized by varying tints throughout the steps of the scale), and some compression at the dark end of scales comprising 128 or more steps. But these issues are of more concern to a user whose work requires precise color matching. In our experience with a broad range of content, the 90GX2's picture is exceptional.

The 90GX2 features a number of color-and-brightness presets intended to enhance various types of content—Photo, Movie, Games, etc. Sadly, the NEC doesn't have any built-in mechanism for height adjustment or screen rotation, although it does offer four powered USB 2.0 ports (along with analog and DVI inputs). And neat freaks might dig this display's cable-management system, which lets you run your signal, power, and USB cables discreetly through the monitor's neck.

The 90GX2's glossy, vibrant screen is known to stop passers-by in their tracks.

NEC 90GX2
$500, www.necdisplay.com
9



Dell offers a feature-rich display at a bare-bones price—again!

Dell 1970FP

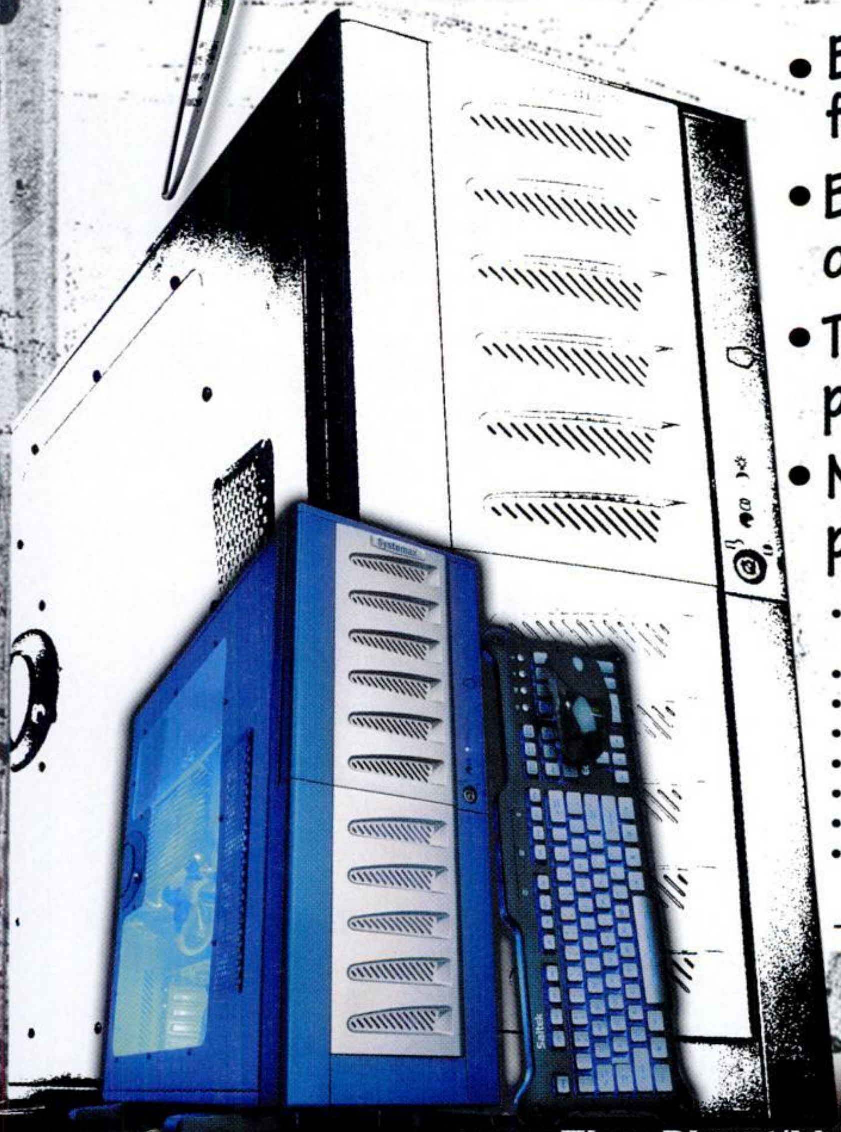
Solid performance at a bargain basement price!

Dell's 1907FP sports a streamlined black and silver aesthetic. The super-slim neck sports a nifty built-in track that lets you adjust the screen's height with ease, by as much as six inches. A Lazy-Susan-esque base offers 45 degrees of rotation to the left and right. The onscreen display is familiar, offering brightness adjustment and separate Red, Green, Blue color sliders when using a DVI connection. In addition to both DVI and analog inputs, the 1907FP includes four powered USB ports. The 19-inch screen has a native 1280x1024 resolution and pixel response time in the single digits, as with the NEC above.

The 1907FP delivers solid performance, although it does suffer a couple weaknesses. On a completely dark screen, the backlight was evident along the bottom edge. And in *DisplayMate* we noticed that very light grays were indistinguishable from white on the extreme low end of the grayscale. The latter point could translate to diminished detail in images that contain a lot of light-colored information, but in our evaluations of various digital pictures, video, and games, we didn't notice a detrimental effect. Indeed, the 1907FP was a reliable performer in all of our tests, though we did detect subtle image ghosting in one gaming test, but only where high contrast—a black object against a light sky—exaggerated the effect.

Continued on page 45

DELL 1970FP
$340, www.dell.com
8



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Continued from page 42

Dell 2407WFP

Big screen fun, at a reasonable price!

Dell's 2405WFP graced the ranks of last year's Dream Machine, so it's only natural that we consider its successor—the 24-inch 2407WFP. Like last year's model, the 2407 sports a slim bezel, a full range of ergonomic adjustment options, loads of inputs (see Spec box), Picture-in-Picture functionality, and two built-in media readers to handle all formats. It also boasts new, hipper onscreen-display buttons and a revamped interface.

In the *DisplayMate* (www.displaymate.com) screen evaluation scripts, the 2407 demonstrated a deep black; a uniform backlight; and strong, though not perfect, grayscale performance. When tasked with reproducing 85 or more steps of gray, we detected subtle differences in hue among the steps, which suggests that the red, green, and blue color channels aren't tracking identically at fine increments of shade. We also saw banding in the horizontal grayscales of 128 or more steps, though the vertical scales were perfectly smooth throughout.

Such slight imperfections won't necessarily show themselves in real-world apps. We looked for any signs of color or detail discrepancies in a series of high-res digital images and a predominantly dark DVD *(Batman Begins)*, and found none. In games, Dell's 2407 also held its own, with a picture that was virtually free of redraw errors at its native resolution. All in all, it's a heck of a package—and at a rock-bottom price.

Once you go widescreen you'll never go back...and you won't do better than the 2407WFP for the dough.

DELL 2407WFP

$850, www.dell.com

9

MAXIMUM PC KICKASS

Samsung 244T

Vibrant colors, at a grayscale penalty

Samsung's 244T toes the line with the same high-degree of ergonomic adjustability that you'll find in most widescreens, such as the Dell above. And also like Dell, Samsung throws in the full complement of connections—albeit just two, rather than four, USB ports—and PiP, but no media reader. Samy also throws in its signature *Magic Tune* software for color tuning and calibrating. And its OSD offers the greatest degree of color adjustment, with slider controls for both hue and saturation.

Samsung's monitors almost always stand out with incredibly vibrant, vivid colors. And sure enough, the 244T's picture looks brighter and more intense than the other monitors here. It's especially noticeable in a visually rich game like *Far Cry*, or when viewing colorful high-res digital pictures. But in *DisplayMate* we noticed that the 244T compresses the dark end of the grayscale range, with little distinction between the darker grays and black. It could be that by increasing the intensity at the light end—to achieve its eye-popping picture—Samsung is sacrificing its darks. We lowered the gamma—it's nice that Samsung lets you do this—and it seemed to help, as do the presets for different content. Set to Entertainment mode, the dark scenes in *Batman Begins* weren't troublesome.

We must note that Samsung's monitor revealed a flaw in *Pixel Persistence Analyzer.* We saw hitches in the 244T's picture, but they were only sporadic, and we couldn't detect a problem in any real-world tests, so we're not dinging it severely. This is a solid alternative to Dell's 2407WFP, though at a higher price.

If vibrant, vivid colors are more important than price, consider the 244T.

SAMSUNG 244T

$1,100, www.samsung.com

8

Pick the Perfect Case

Make sure you give your components a happy home

Though most people upgrade videocards and hard drives on an annual basis, they rarely upgrade their PC case, unless tragedy strikes. The reason is simple: The ATX specification for cases has been around a long time, and it's still getting the job done. Simply put, there's usually little reason to upgrade unless you're looking for more room, more cooling or a more pleasing aesthetic. Indeed, these are the most important characteristics of a case: it must be able to hold all your hardware, and have enough fans to keep everything cool and relatively quiet.

CASE FANS: All cases include some sort of cooling system, though whether or not the actual fans are inside the case at the time of purchase varies. Regardless, every case has fan mounts, and it's important to see what size they are prior to purchase. We typically favor large 12cm fans because they spin slowly, and therefore are relatively nice and quiet—and move a lot of air. You'll want to make sure there's a fan in the lower front of the case to suck air into the PC, and a nice, big fan in the back to blow it out. Some fans include exhaust fans on the top or side of the case, too, but these aren't always necessary and can add a lot of unwanted noise.

FORM FACTOR: The lion's share of consumer-level motherboards conform to the ATX specification, so make sure the case in question supports this standard (most do). Once you know it supports ATX, the only big question left is, How big do you want to go? There's mid-tower cases, which are the size of what most consider to be a "regular" desktop, and there's full-tower cases, which are much larger and longer than a mid-tower. Though their size makes them unsuitable for frequent transport to LAN parties, full-size towers are a breeze to work in given their cavernous interiors. They can also hold a lot of hardware, which is nice if you have several hard drives, are running SLI, or are thinking about investing in water cooling. For most users, however, a mid-tower will be more than sufficient.

FRONT-MOUNTED USB: This feature—having USB ports mounted on the front of the case for easy access—used to be a delicacy, but it is now almost standard fare. Still, pay attention to their location, as sometimes they're on the bottom-front of the case, and other cases put them right at the top, which is nice if your PC is resting on the floor. Some also offer front-mounted audio jacks and FireWire, which may be important to you.

Thermaltake Armor Jr.

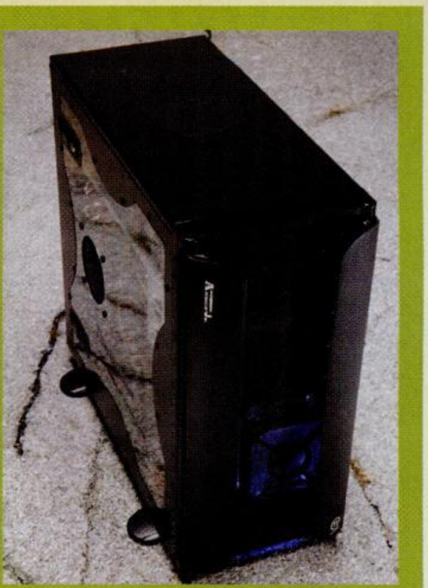
A little case with big ambitions

The aptly named Armor Jr. is a smaller, mid-tower version of Thermaltake's gigantic Armor case—a case that ruled our Best of the Best list for most of 2005. The smaller version is just what the doctor ordered, as the regular Armor is a bit *too* big for most people, and a little flimsy. The Armor Jr. is rock-solid, elegant, and a delight to work in. Though it's missing some of the Armor's more extravagant features, it's still a helluva mid-tower.

The power supply mounts in the top of the case and can be flipped upside down if you don't want it sucking air from the CPU area.

The steel chassis has a plastic front bezel with aluminum wings. The door can be locked shut to prevent people from mucking with your 5.25-inch drives. There are a total of six 5.25-inch bays, including one at the bottom of the case designed to hold a water-cooling reservoir. The 5.25-inch drives use clip-on drive rails that are a snap to install. There's also a vertically oriented cage next to the intake fan designed to hold a Raptor X hard drive, which sits flush with the case window in order to show off the hard drive's internals.

The internal drive cage holds four hard drives. We love its rubber grommets, which ensure silent operation. A silent 12cm fan with blue LEDs sucks air into the case and blows it over the drives. The expansion cards are secured using a plastic tool-less fastener. It works OK, but it feels flimsy and seems out of place in a case that's otherwise very sturdy and brimming with features. All in all, that's the only flaw in an otherwise brilliant enclosure.



The vertical space next to the front intake fan is designed to hold a Raptor X hard drive, so you can ogle it's internals through the case window.

THERMALTAKE ARMOR JR.
$115, www.thermaltake.com
9
MAXIMUM PC KICKASS

Continued on page 48→

SMILODON

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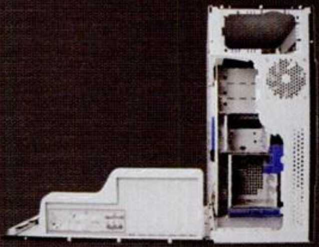
DIRK-TOOTH



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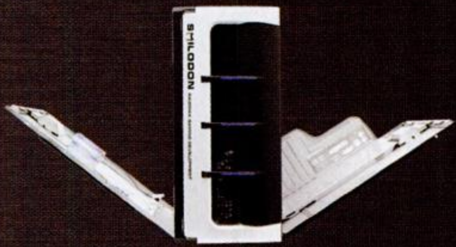

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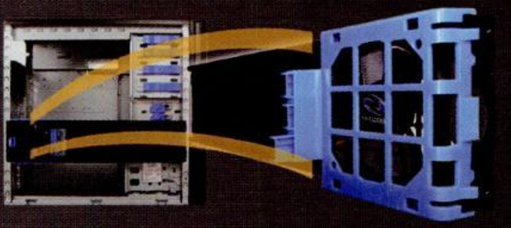

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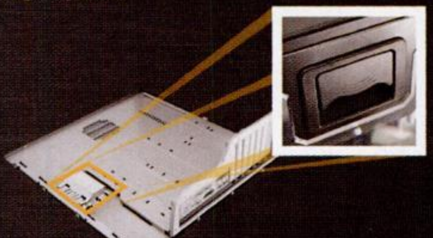

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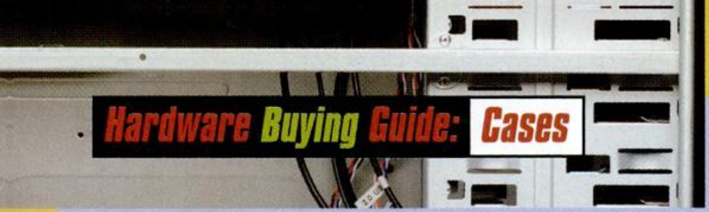


Continued from page 46

Thermaltake Eureka

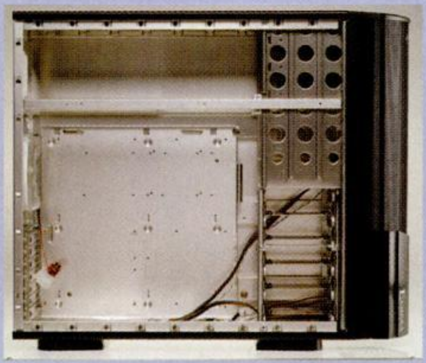
There's no such thing as a case that is too big

Holy schnikes, this is one mammoth case. Labeled a "home server" case by Thermaltake, the Eureka is one of the largest cases we've ever tested. It's also one of the lightest, thanks to its all-aluminum construction, yet it's plenty sturdy and rugged. While we found it a dream to build in this case, it's missing a certain *je ne sais qua* that would have us drawing pictures of it on our notebooks during Algebra.

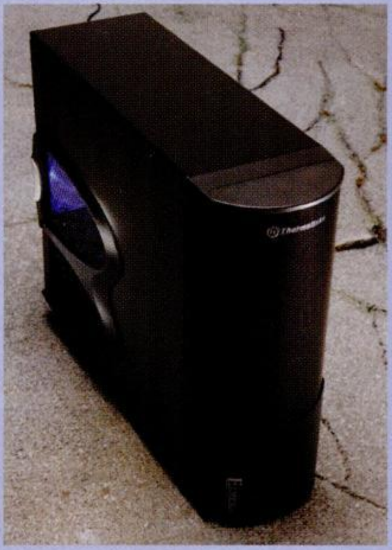
The Eureka's massive concave bezel is just for show: Swing it open and it's an empty shell, covering five 5.25-inch drive bays and two 3.5-inch bays. Optical drives are installed via screw-on rails. Hard drives mount to a tray via screws, which you then slide into a rail system. You can install a total of five hard drives, more than enough for even a power user, and we love the included rubber grommets, which keep the drives nice and quiet. A quiet 12cm fan blows air over the sideways-facing hard drive cage.

As we'd expect from a case this large, cooling is exemplary. A second 12cm blue LED fan handles exhaust duties (and honeycomb air vents in the case door allow you to even see the glow when the system is up and running). The case comes precut for an external radiator; there are even two holes in the upper chassis to make running tubes simple (we like this trend!). There's plenty of room for oversized PSUs, so that 1-kilowatt jobbie will fit just fine. There's also a removable motherboard tray, which is a scarcity these days. Sadly, the I/O ports are on the right-side of the case, making them difficult to access unless the case is on your left.

We dig this case's solid chassis, and its design will certainly accommodate your hardware, but it falls just shy of greatness.



The Eureka is billed as a server tower, and as such can easily accommodate both regular ATX and Extended ATX mobos.



Thermaltake calls the Eureka a "speaker design." Whatever it is, we like it.

THERMALTAKE EUREKA	9
$190, www.thermaltake.com	

Lian Li PC V-1200 Plus

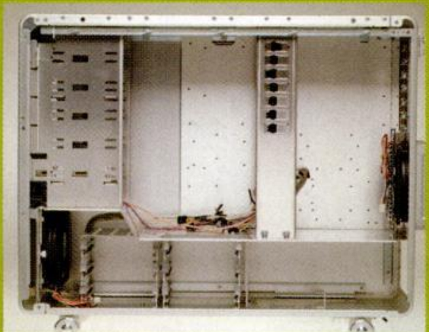
Lian Li has done it again

The PC-V1200 Plus is like the baby bear's bed in the *Three Little Bears*: It's not too small, not too big, but just right. Although it's the same height as the PC-V1000 mid-tower (reviewed Holiday 2005), it's about four inches longer and much roomier. This is damn-near the perfect mid-tower case—if you can stomach the price tag, that is.

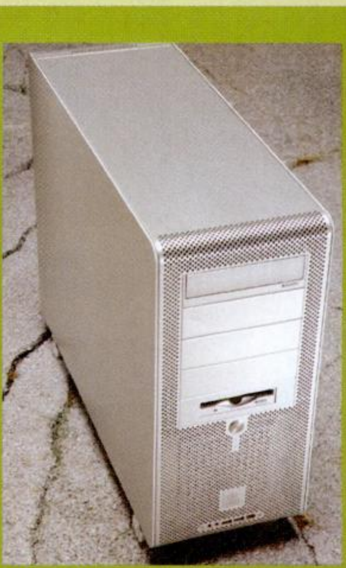
The case sports an upside-down ATX design and opens on the right side, which could cause problems if you have a heatpipe-cooled chipset or a water-cooling kit that uses a case-mounted radiator. Those scenarios are few and far between, however; and for 99 percent of configs this design work perfectly.

Inside you'll find a roomy, spacious interior. A removable bar fitted with plastic tabs runs above the expansion-card area. The bar will keep your expansion cards from popping out, even if the rig travels long distances. The hard drives and PSU are in a separate chamber at the bottom of the case, which isolates them from the rest of your components. There's even room for super-long ATX power supplies, which are necessary for some dual-videocard rigs.

There are two three-drive bays for hard drives, which are each cooled by a silent 12cm fan. The only thing we don't love about the PC-1200 is Lian Li's hard drive installation mechanism. You attach screws to the drives, which act as rails. Then you push the drive into slots on the rack, and lock down a tab to secure it. This design amplifies drive noise, but it's very easy to use and secures the drives well.



Having the hard drives and PSU in a separate chamber with their own fan provides better airflow than the standard ATX design.



We call these three-quarter views "beauty shots," and in this case it's a literal description. The PC-V1200 is one gorgeous case.

LIAN LI PC-V1200 PLUS	9
$225, www.silverpcs.com	MAXIMUM PC KICKASS

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Sound Advice

Yes, you do still need an add-in soundcard!

We'll admit that we're soundcard bigots, but we've long had good reason. Onboard audio has traditionally sounded poor in comparison, and we'd rather have calculations for sound effects done on a soundcard's dedicated digital signal processor (DSP), rather than on the CPU, which can result in a frame rate hit in our favorite games.

These arguments, however, are slowly running out of steam. With Microsoft Vista hardware acceleration for 3D sound in games could become moot, as DirectX 10 no longer supports DirectSound 3D acceleration. Acceleration won't totally die, though. Creative is pushing an open API called OpenAL. OpenAL is already in many current games, and it is picking up momentum, which should keep some form of audio acceleration going.

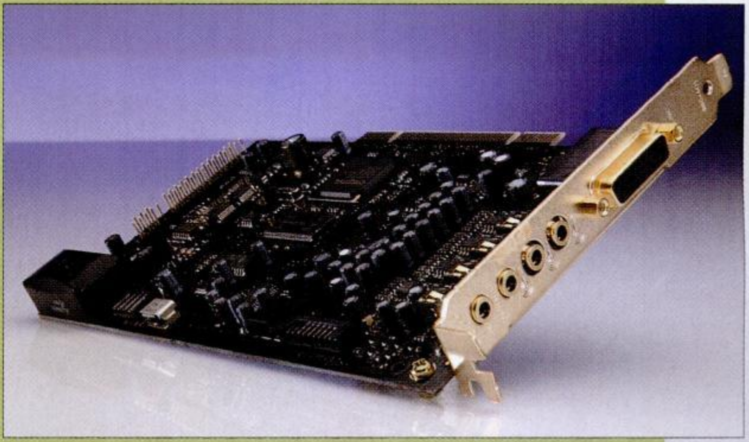
Taking a load off the CPU, however, isn't the argument to buy a soundcard that it was in 1997 when we had a 400MHz Pentium II CPU. With today's quad-core CPUs bumping up on 3GHz, and all of the graphics work being unloaded to the videocard, what the hell is left for the CPU to do but outsource the soundcard?

With that said, onboard audio got markedly better with Intel's HD Audio spec, which increased audio fidelity from 16- or 18-bit to 24-bit with up to 192kHz sample rates. Motherboard makers are also making moves to decrease problems that are fundamental with onboard audio: components are mounted on the electrically noisy surface, which can degrade signal quality. To alleviate this issue, some mobo-makers mount the components on small daughter boards, which elevates the sensitive components above the "noise".

Onboard still has its limits though. We recently found that the current drivers for Realtek's HD Audio CODECs don't handle EAX correctly. Fire up a game on a mobo with a Realtek part, enable EAX, and you won't be able to tell if something is far away or close. Unfortunately, Realtek components are used in the majority of motherboards out right now. We believe the company could fix the problem in its drivers, but will it? Onboard audio chips from Sigmatel and Analog Devices work correctly and render audio closer to what the game makers intended.

Despite all this, the soundcard still isn't dead. Creative Lab's X-Fi series delivers about the best you can get in game audio. Others, such as AuzenTech's X-Meridian 7.1 feature support for real-time Dolby Digital encoding – the one feature onboard audio has held over add-in boards for some time. And the only way onboard audio can be upgraded, aside from ripping out your mobo and replacing it with a new one, is to drop in a soundcard.

CREATIVE LABS SOUND BLASTER X-FI



With its 400MHz core speed, 51 million transistors, and 10,000 MIPS, the X-Fi, according to Creative, has 24 times the power of an Audigy 2 ZS and equals the power of a 3.4GHz general-purpose CPU.

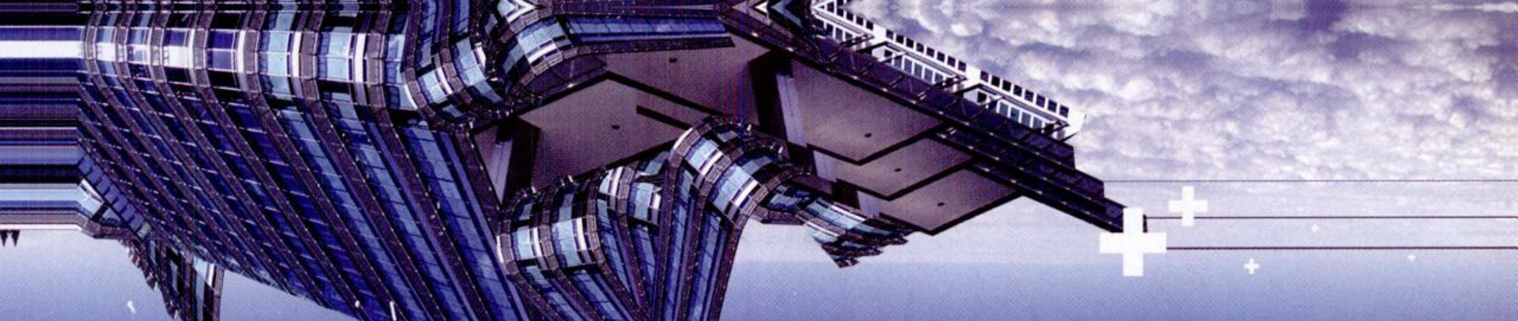
Creative is building the X-Fi into three distinct PCBs, with four versions of the card available at retail. The basic X-Fi XtremeMusic features a multichannel 24-bit Cirrus Logic DAC, a Wolfson 24-bit ADC, and 2MB of "XRAM." The X-Fi Platinum adds a bay adapter to the XtremeMusic's mix. The Fatal1ty FPS uses the same DACs as the XtremeMusic but ups the XRAM to 64MB and gives you a status LED. (What's XRAM for? It will act as a local audio buffer eventually, but right now, it doesn't do much.) All three can hit 109dB SNR, which is just a tick better than the 2 ZS' 108dB. Finally, the Elite Pro can hit 116dB thanks to its higher-end AKM DAC.

In music, movies, and games, the X-Fi sounded better than HD Audio. In Battlefield 2 with HD, comm chatter sounded synthetic and the positional effect was poor. With the X-Fi, a tank's engine rumble was occluded when it moved around a corner to the other side of a building. Furthermore, we experienced actual game hitches in Battlefield 2 with HD Audio; with the X-Fi, there were none. With the X-Fi, you get better audio and frame rates.

The X-Fi isn't perfect. We're disappointed we can't tune headphone acoustics like we could on many Sensaura parts. On the base XtremeMusic card, you can't even program the jacks to support headphones and speakers simultaneously. And we definitely don't think the extra RAM and pointless LED in the Fatal1ty FPS card are worth extra cash.

Still, it's hard to foresee anyone making a better all-purpose soundcard than the X-Fi series in the near future. Despite predictions of its death, it's pretty clear to us that the soundcard is still alive and kicking. MPC

CREATIVE LABS X-FI
$130, www.soundblaster.com
9
MAXIMUM PC KICKASS



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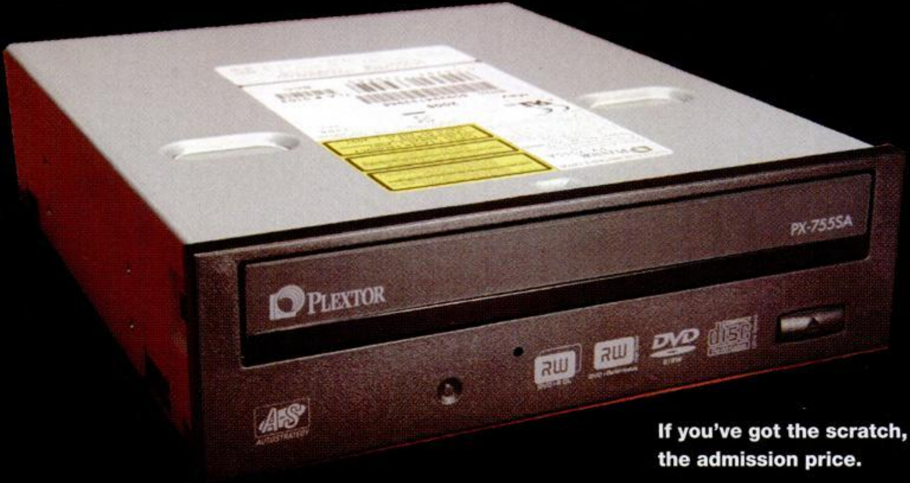
Optical Drives

Spendthrift or miser, there's a decent optical drive out there for you!



If you've got the scratch, Plextor's PX-755SA is worth the admission price.

Lucky you—these days, you buy a combination CD and DVD burner for less than the cost of a year's subscription to *Entertainment Weekly*, and the chances are good that this drive will work almost as well as a top-shelf drive would. Just make sure to use some of the money you save to buy high-quality writeable or rewriteable media, preferably from the list of recommended media that should come with the drive's documentation (unless you're OK with your disc coughing up read errors two months later or not working in other folk's drives).

But if you're willing to pay the premium for a high-quality drive—and considering how much use you'll get out of your optical drive, we hope you are—there are just a few essential specs to pay attention to that are easy to comprehend. The most obvious are the read and write speeds of the drive—today's burners top out at 18x writing to DVD media, and 16x for reading. A very high-quality drive should have access times in the two-digit range, but don't rely on the manufacturer's say-so for this number; double-check the figures with the results from two or three independent reviews. Finally, make sure you purchase a drive with a SATA connector (provided, of course, you have a motherboard that supports SATA ports and there's at least one free), as parallel connectors on motherboards are on their way out.

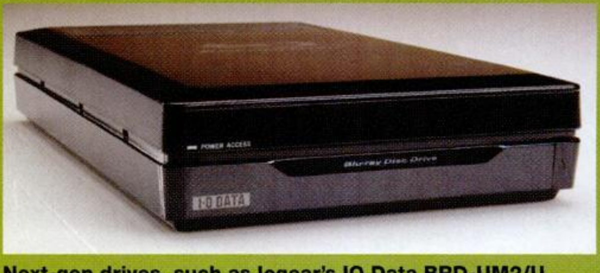
It can pay off—literally—to splash out on a more expensive drive, especially if you're a member of the frequent burner club. Maximum PC recommends the PX-755SA ($130 MSRP, **www.plextor.com**) from optical drive *wunderkind* Plextor, which lets you burn to writeable DVDs at speeds higher than what they're rated for, so you can save a chunk of change by purchasing cheap 2.4x media and burning to it at 6x, for example. The PX-755SA also has a unique feature for paranoiacs: It can destroy the data on write-once media by re-burning the entire surface of the disc.

Blu-ray and HD-DVD

The two competing formats for "next-generation" optical drives, Blu-ray and HD-DVD, both offer writeable and rewriteable discs with capacities well above that of traditional, red-laser drives (up to 50GB for Blu-ray discs, and up to 30GB for HD-DVD), and both have high-definition versions of popular movies already on store shelves. So why aren't we more excited?

As a storage and backup medium, neither format holds up well in comparison to today's external hard drives, which offer much larger capacities, exponentially faster read and write times, and are far less expensive. Both formats also incorporate astonishingly harsh copy protection. In order to enjoy a Blu-ray movie on your PC at its full resolution, for example, you're required to have a videocard and monitor that support HDCP (High-bandwidth Digital Content Protection), or you'll be stuck watching the movie downsampled to standard DVD resolution (and don't even *think* about trying to convert that movie you just bought into a format you can watch on your iPod).

Even if you're willing to pony up the money to buy all this hardware just to see the pores on Adam Sandler's nose, you're still gambling that the format you choose—Blu-ray versus HD-DVD—will still be widely supported by movie studios in a few years.



Next-gen drives, such as Iogear's IO Data BRD-UM2/U, have promise but are expensive and have an uncertain future.

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Duel
Yield
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Controllers & Speakers

What's the point of a killer rig if you skimp on the extras?

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The Xbox 360 controller uses a standard USB connection, so the corded version is compatible with both the Xbox 360 and the PC. Note: A wireless version is due soon, too.

$39.99, www.microsoft.com **8**

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$70, www.logitech.com **9** MAXIMUM PC KICKASS

HEADPHONES

Alienware Osma 7 Headphones

People are always asking us what our favorite headphones are for gaming, and right now the Osma 7's are tough to beat. Sure, they ain't cheap, but if you're serious about your gaming, and your rig is armed with the latest in audio hardware, they are a worthwhile investment. Trust us!

$200, www.alienware.com **9** MAXIMUM PC KICKASS

JOYSTICK: CASUAL

Cyborg Evo Force

This stick has it all: force-feedback effects, rudder twist, plenty of programmable buttons, a stylish look, and a fair price! Heck, you can even customize the stick for right- or left-handed use! This stick will suit your needs for everything from arcade to driving and flying games. Non-FF wired and wireless versions are also available.

$70, www.saitekusa.com **8**

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If you play driving games, you owe it to yourself to pick up this wheel. It's pricey, but you get your money's worth. How do stainless steel and real leather construction, simple installation and programming, and true 6-speed manual shifting—with brake, clutch, and gas pedals—sound to you?

$300, www.logitech.com **9** MAXIMUM PC KICKASS

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$400, www.logitech.com **9** MAXIMUM PC KICKASS

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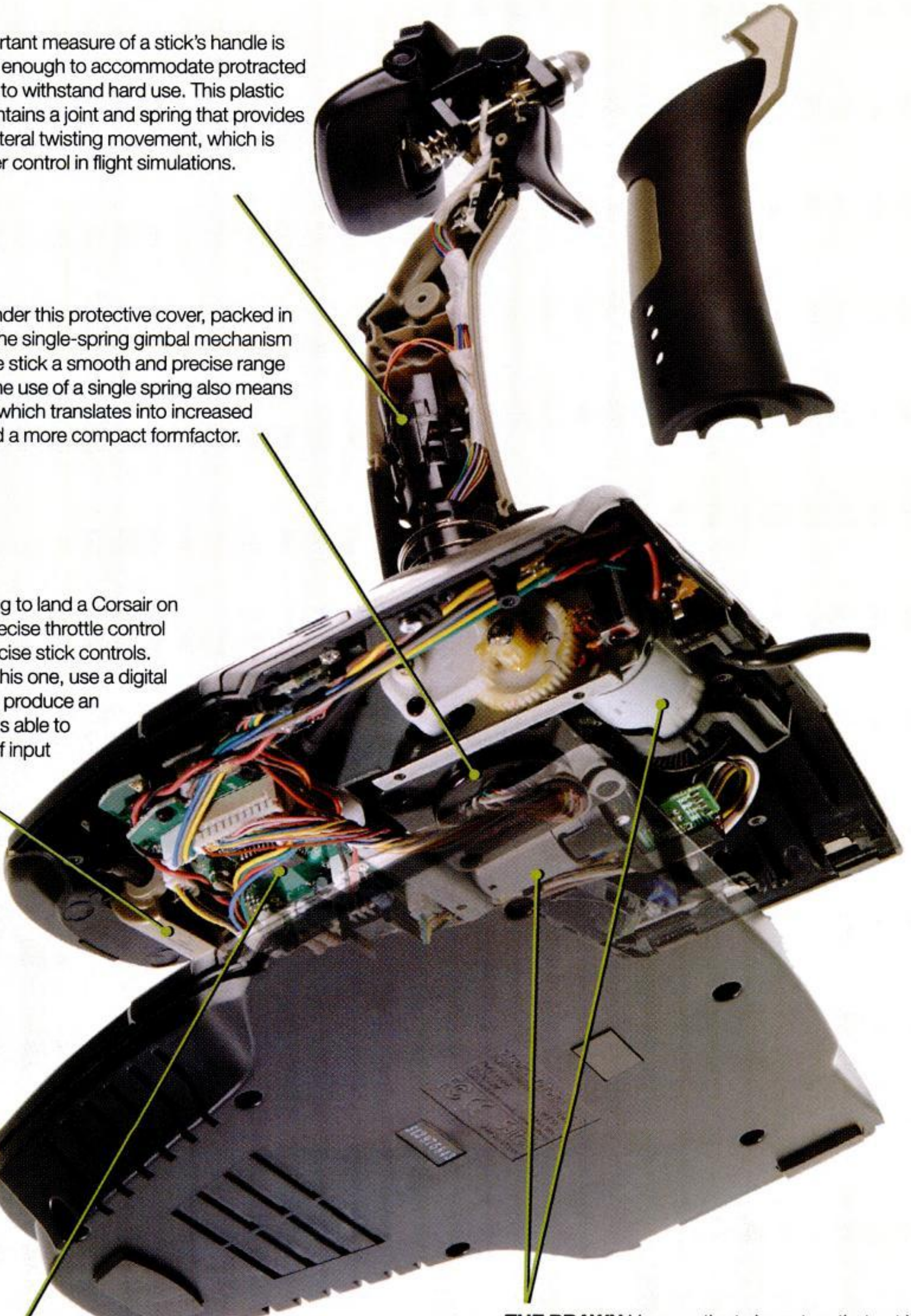
Force Feedback Joystick

The first force feedback joysticks were expensive, huge, heavy, and not the most precise controllers a gamer could ask for. That's all changed with current models. We hack into Saitek's Cyborg Evo Force to see what makes it tick



HANDLE The most important measure of a stick's handle is comfort. It should be slim enough to accommodate protracted use, yet still large enough to withstand hard use. This plastic shell inside the handle contains a joint and spring that provides resistance to the stick's lateral twisting movement, which is commonly used for rudder control in flight simulations.

MOTION Under this protective cover, packed in grease, lies the single-spring gimbal mechanism that gives the stick a smooth and precise range of motion. The use of a single spring also means fewer parts, which translates into increased durability and a more compact formfactor.

THROTTLE If you're trying to land a Corsair on a pitching carrier deck, precise throttle control is just as important as precise stick controls. Most joysticks, including this one, use a digital optical-sensing system to produce an exact level of control that is able to sense even the smallest of input adjustments.

THE BRAINS It might be green, but this circuit board is home to the stick's grey matter: the circuits, memory, and chipsets that translate in-game API calls into realistic force-feedback effects. This chip (behind wires) is a low-power, low-voltage 524,288-bit one-time programmable read-only memory chip that stores the data for the various force-feedback effects that the stick can model.

THE BRAWN Here are the twin motors that act in tandem to produce force-feedback effects on both a horizontal and vertical axis. Attached to the motor's axles are digital optical sensors, just like the one used to control the throttle input. So, the stick uses the same mechanism to measure the position on each axis as it uses to impart forces to the stick.

Budget

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Badass

Gaming PCs are usually ludicrously expensive—not this one. Our hand-built rig rips through today's games and has plenty of room for upgrades, all for the reasonable price of $1,600!

Earlier this year we built a gaming PC with a hard-core budget of $1,000. This time, we wanted to see what we could do with a few more clams to give us a rig that could handle today's most demanding games, and that would give us a nice upgrade path to run Microsoft's looming Vista OS and the wave of DX10 hardware and games that will follow.

The $1,600 rig you see here not only meets these goals, but it looks pretty sweet too in its snazzy Antec Solo case. And with 400GB of hard-drive real estate, you won't need to worry about running out of space for your games, music, pics, "multimedia collection," or future OS upgrade either! (That said, you could certainly scale back a bit with the case and hard drive to save some dough if that's more important to you.)

Still, to meet our aggressive price limit ($2,500 is when you start to hit high-end gaming territory) we did have to make some compromises. We wanted a solid gaming PC, but with DirectX 10 videocards and quad-core CPUs coming down the pike, we didn't want to overspend in these areas now knowing that we'd probably want to upgrade relatively soon. Thankfully, Intel's new Core 2 Duo offers awesome performance, dual cores—and extreme overclocking capabilities—at an almost obscene rock-bottom price tag. We cranked this proc up from its stock 1.86GHz speed to 2.86GHz without breaking a sweat. (We could have pushed it even further but opted for extreme stability instead.) Down the road we can swap out this puppy for a quad-core proc when more games are available that will take advantage of the extra horsepower.

Right now you can get some awesome values with some kickass midrange videocards—spending $500 on a top-of-the- line card right now that is not DirectX 10-compatible simply doesn't make sense, unless you've money to burn. The 7900GS gives our little rig enough video muscle to play games such as *F.E.A.R.* and *Oblivion* at standard resolutions up to 1280x1024. If you want to go higher, you can always add a second card for SLI, but again we recommend holding off and opting for a midrange (or better) DirectX 10 card, which should be widely available in a few months. And finally, we spend a bit more on a hot-off-the-assembly-line eVGA nForce 680i SLI mobo, which gives us top performance and all the upgrade options we will need for the foreseeable future.

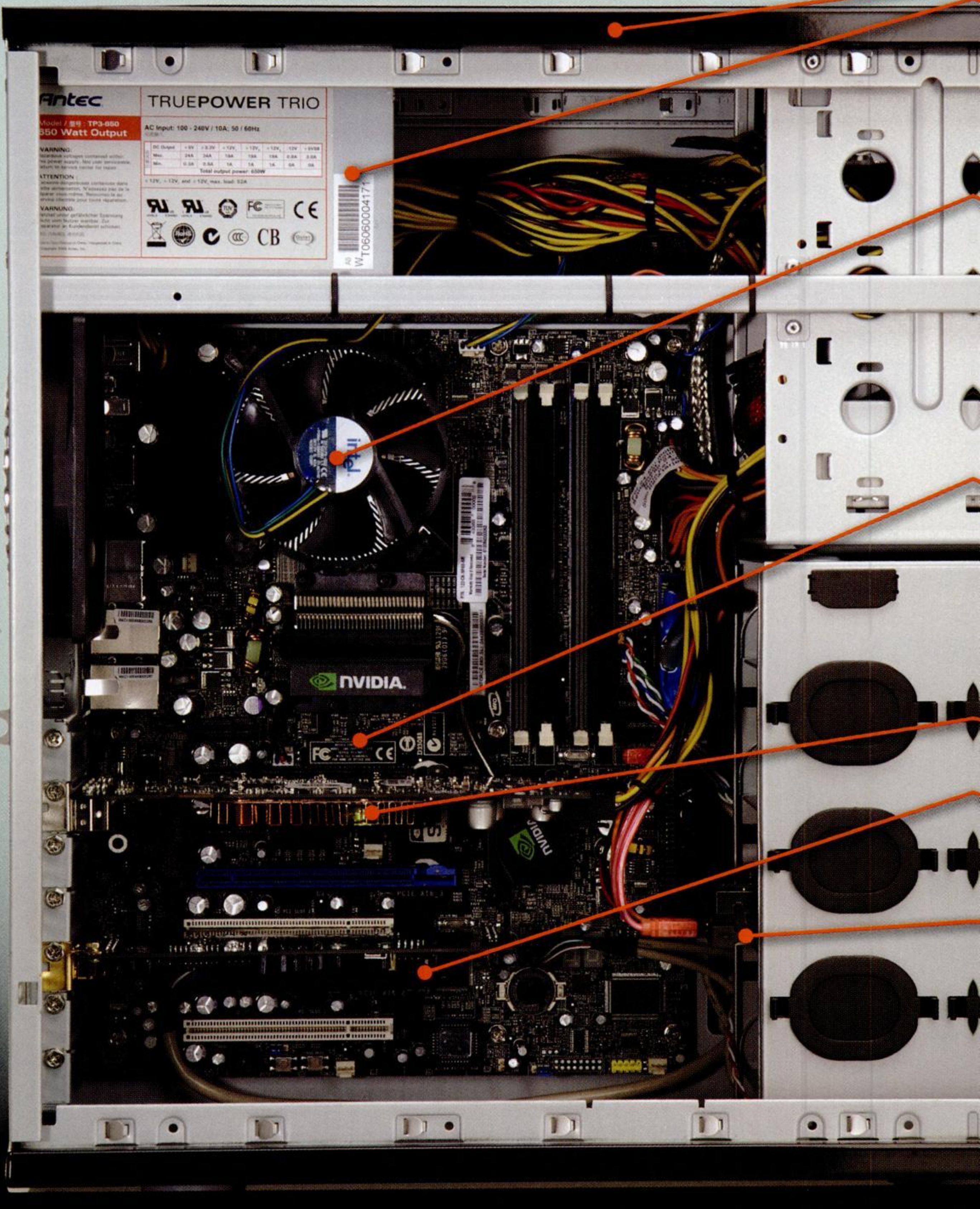
Still, there's no need to even discuss upgrades at this time, as this machine can handle anything today's game devs can throw at it. Read on for details of the full config and the benchmarks.

BIG HUGE
Microsoft
PC
EA
DVD

BY STEVE KLETT

OUR Budget Badass

This rig offers gaming muscle, upgradeability, and invaluable DIY pride—with style to spare!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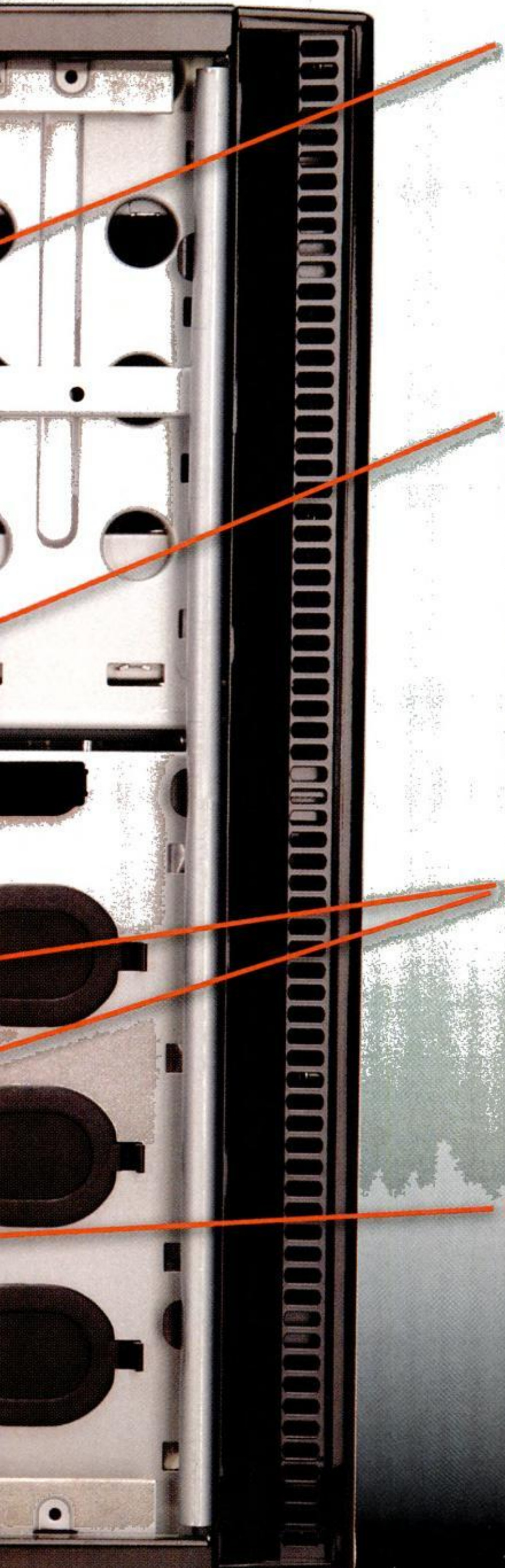
Case/PSU: Okay, we went with a bit of bling with the Antec Solo case, which rings in at $90 and does not include a PSU. However, we wanted our rig to look cool, and we dig the Solo's ultra-quiet drive-mounting options, the easy-access the hinged front-panel affords, and the front-mounted USB and Firewire ports. It is a mini-tower case so it may be a bit cramped, depending on your upgrade plans. If you'd prefer more elbow room, check out our other case recommendations on page 46. For the PSU we elected Antec's tried-and-true TruePower Trio 650, which will give us plenty of juice for our proc, DX10 videocard and/or SLI upgrades down the road.



CPU: The brains behind the whole operation is Intel's Core 2 Duo E6300, which rings in at a seemingly paltry 1.86GHz. However, we quickly overclocked this amiable proc to a much more respectable—and rock-solid stable—2.86GHz! (Bargain-bin chips usually overclock quite well, and the Core 2 Duo is no exception.) With 2MB of L2 cache and a 1,066MHz Front-side Bus, it's certainly not gimped. And it's low price means we won't cry when we replace with a quad-core proc down the road.

Motherboard: Hot off the fabs, eVGA's new nForce 680i SLI mobo features nVidia's newest chipset, the, umm, 680i. Unlike the nForce 590 SLI Intel Edition chipset, which had limited overclocking capabilities, the 680i is designed for overclocking, and it is the chipset of choice to run nVidia's next-generation DirectX 10 graphics cards. We dig several features in the eVGA board (which is actually made by nVidia) such as SLI support, three x16 slots, support for up to 8GB of DDR2 RAM, a slick North Bridge fan, and its overclocking capabilities—which let us push our proc by about 1GHz, with stock cooling.

Videocard/Soundcard: Pumping the pixels is nVidia's new middleweight champion—the 7900GT. We selected the BFG 7900GT OC, and this card churned out respectable benchmarks for a very reasonable price. It's SLI-capable, and it hosts 24 pixel pipelines and eight vertex shaders—just like its more costly cousins, the 7800 and 7900GTXs! For sound, we still eschew on-board audio in favor of Creative's X-Fi card.

Hard drive: We went with our favorite 400GB drive, the Western Digital SE 16, because with the size of today's game installs, and the fact that most of us want to use our PCs to host music, movies, pics, etc., we didn't want to skimp on space. And the drive's 16MB buffer and 7,200RPM speed means it can handle the most demanding games with ease.

THE SPECS

CPU: Intel Core 2 Duo E6300
$180, www.intel.com

RAM: 2GB Corsair XMS2 DDR2
$300, www.corsairmemory.com

Videocard: BFG GeForce 7900GT OC
$300, www.bfgtech.com

Hard drive: Western Digital se16 400GB
$140, www.wdc.com

Mobo: eVGA nForce 680i SLI
$250, www.evga.com

Optical drive: Lite-on SHM-165H6S04C w/LightScribe
$40, www.liteon.com

Soundcard: X-Fi Extreme Gamer
$90, www.creativelabs.com

PSU: Antec Trio 650
$120, www.antec.com

Case: Antec Solo
$90, www.antec.com

Operating System: XP Pro OEM
$80, www.microsoft.com

Total: **$1,590**

Continued on page 63→

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- 160GB 7.2K SATA2 8MB cache	- 160GB 7.2K SATA2 8MB cache	- 1.20TeraB Hswap RAID Mode5
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- Xi MTower 500wPS 52xCD-RW	- Xi MTower 550wPS 52xCD-RW	- Xi 21Bays or 4U w/Dual HS PS
- MS Window® XP or LINUX® RH	- MS Window® XP-Pro or Linux®	- RedHat®Linux®/MS®XP-PRO64
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Continued from page 61

Putting Our Budget Wonder to the Test

All that cost savings wouldn't mean squat without the benchmark numbers to back it up!

We performed some preliminary benchmarks during our videocard/CPU selection, so we had a pretty good idea where this rig would stand before we subjected it to our full battery of tests. Regardless, we're still impressed with our baby box. It handled everything we threw at it, and ran *Quake 4* at 59fps with all options set to High.

The only rub to speak of is the resolution issue. We ran the tests at a midrange resolution of 1280x1024, which is still a fairly common resolution these days. Heck, most 20-inch flat panels sport a maximum resolution of 1280x1024! This really wasn't a huge surprise, but gaming performance slowed to a crawl when we cranked up the resolution and AA settings.

Since we chose an SLI-capable motherboard, one of the very first upgrades we'd make to this rig would be to slot in another 7900GT for hot, sweaty dual-card action—if you want to game at higher resolutions. Next we'd swap out the CPU for a beefier quad-core—again, when games experience enough of a performance gain to justify the move.

Battlefield 2 Special Forces
Prey
Call of Duty 2
Battlefield 2
Brothers in Arms Earned in Blood
Dungeon Siege II Broken World
Rise of Legends
Dungeon Siege II
Company of Heroes

Whatever game you've got, this rig can handle it!

BENCHMARKS

	1280X1024	1600X1200
3DMARK05	8,697	N/A
3DMARK06	4,909	N/A
FEAR (FPS)	55	35
QUAKE 4 (FPS)	78	59

Game tests were run at 1280x1024 and 1600x1200 with all settings on High. F.E.A.R was run with no AA and 16x anisotropic filtering. Quake 4 was tested with 4x AA and 4x anisotropic filtering. 3DMark05 and 06 were run at the default settings needed to obtain an official score.

For the purposes of our budget, we focused solely on building a self-contained rig, assuming you'd use your current monitor, keyboard, mouse, and speakers. If you want to spec a full system, we've plenty of great options in the buyers guide, which starts on page 10.

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Direct3D 10 Unveiled!

THE TECHNOLOGY BEHIND THE NEXT GENERATION OF PC GAMING

DirectX 10 and its Direct3D 10 parter's next-gen PC graphics prowess will make the latest consoles drool with envy! This is a scene from the upcoming shooter *Crysis*...not bad, eh?

Maintaining backward-compatibility is a drag for both developers and consumers. Developers must write spaghetti code to accommodate all manner of yesterday's hardware, leaving consumers saddled with bloated software that fails to take full advantage of their state-of-the-art gear. Direct3D 10, the upcoming graphics component of Microsoft's DirectX, promises to buck that trend.

For the first time since introducing the DirectX collection of APIs more than 10 years ago, Microsoft is jettisoning the entire concept of backward-compatibility: Not only is Direct3D 10 designed exclusively for Windows Vista—rendering it incompatible with every previous version of Windows, including XP—it also requires new hardware to run as intended. And that's a *good* thing—honest.

The decision to throw the baby out with the bathwater couldn't have been easy for Microsoft, but it enabled the Direct3D team—in consultation with ATI, Nvidia, Intel, S3, and others—to spend more than three years rethinking this critical tool. Here's a high-level look at what we can expect from the next generation of Direct3D.

A WHOLE NEW PIPELINE

Three-dimensional graphics are created by sending rudimentary objects through a programmable pipeline to emerge as richly detailed objects at the other end. Previous versions of Direct3D envisioned two separate virtual machines—a vertex-processing engine and a pixel-processing engine—that could perform operations on vertices and pixels as they moved through the pipeline. Direct3D 10 adds an entirely new stage to the pipeline: a geometry-processing engine.

Each of these engines executes specialized chunks of computer code, called shaders, which enable software developers to create simple wire-frame models and then transform them into extremely complex-looking objects complete with depth and realistic lighting. Vertex-shader programs manipulate points in three-dimensional space—identified by X, Y, and Z coordinates—to create a simple 3D object known as a primitive.

In Direct3D 9.0, the vertex shader hands the primitive off to the rasterizer, which breaks the object down into pixels—the smallest elements that comprise an image. A pixel-shader program then goes into action to process these individual pixels, assigning attributes such as color and lighting effects

Continued on page 68→

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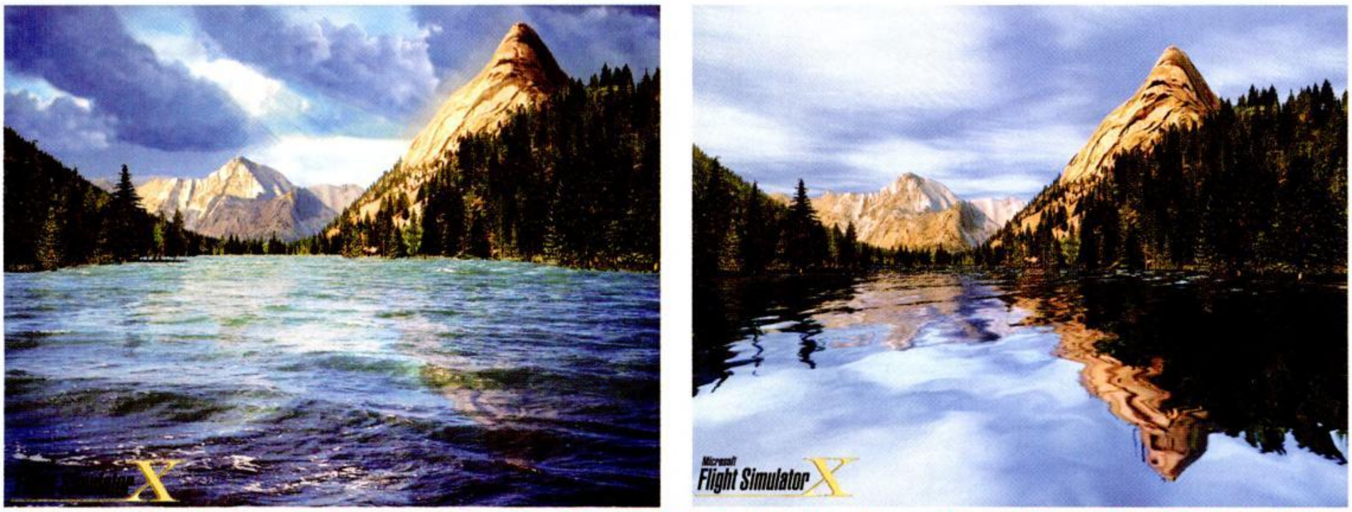
Continued from page 66

Direct3D 10



These are artist renderings of what a scene should look like in *Flight Simulator X* running on Vista and Direct3D 10 (left) and on Windows XP and the current Direct3D 9 (right). Which one would you rather play? The first DX 10 videocards are here (see page 29), now all we need is Vista!

to each one. Direct3D 10 places the new geometry-shader virtual machine in between the vertex shader and the rasterizer to perform additional operations on the primitive before the rasterizer breaks it down.

Vertex-shader programs are limited to manipulating individual vertices, but geometry-shader programs can operate on *all* the vertices that make up a primitive at once. What's more, a geometry shader can create entirely new primitives based on an incoming original. For example, a geometry shader might increase the number of objects it outputs to the rasterizer by cloning a primitive it receives from the vertex-processing engine. Or it could subdivide that primitive into hundreds of smaller objects.

A geometry shader can assign additional attributes to a primitive, as well. It might take a triangle and extrude its edges to create a tetrahedron, for example. It can also reduce the workload on the pipeline stages that follow it by taking a primitive from the vertex shader, determining that the primitive will ultimately not be seen in the final image—perhaps because it will be obscured by other elements in the scene—and then not outputting that object to the next stage in the pipeline.

A UNIFIED SHADER ARCHITECTURE

Modern GPUs feature parallel pipelines, so that several operations can be performed on several primitives—and then several streams of pixels—at the same time. And because pixel-shading operations tend to be more compute-intensive than vertex-shading operations, most GPUs have more pixel shaders than vertex shaders.

ATI's Radeon X1950 XTX, for instance, has eight vertex-shader units and 16 pixel pipelines, but 48 pixel-shader units—three for each pixel pipe. Nvidia's GeForce 7900 GTX, on the other hand, maintains a one-to-one relationship between pixel pipelines and pixel-shader units—there are 24 of each, plus eight vertex-shader units. In both cases, however, vertex-shader units are strictly limited to executing vertex-shader routines, and pixel-shader units are strictly limited to executing pixel-shader code.

Microsoft considers these designs an impediment that should be done away with. The way Microsoft sees it, if the GPU is in the midst of performing intense geometry processing, its vertex-shader units will likely be fully utilized while its pixel-shader units are left with little or nothing to do. By the same token, if the GPU is faced with a heavy pixel-processing workload, its pixel-shader units might get bogged down while its vertex-shader units twiddle their proverbial thumbs.

Microsoft designed Direct3D 10 to favor a unified shader architecture: Instead of relying on GPUs with discrete units dedicated to executing either vertex-, geometry-, *or* pixel-shader programs, the new Shader Model 4.0 is designed to run on common shader-processing engines that are capable of performing *any* of these three operations. A thread arbiter on the GPU will analyze the incoming workload and assign appropriate processing resources for the incoming shader programs; that way, no processor power goes to waste while waiting for work to travel down the pipeline.

GPUs built around Direct3D 10 and Shader Model 4.0, Microsoft contends, should be capable of rendering more objects, materials, particles, vegetation, and shadows while consuming fewer CPU cycles and requiring less memory bandwidth. This will become particularly important if physics acceleration gains a toehold, whether that work is performed by a dedicated coprocessor, such as Ageia's PhysX PPU; a second videocard in a dual-GPU system like CrossFire or SLI; or on a second, third, or fourth core in a new CPU architecture.

In another major departure from Direct3D 9.0, hardware must support all but a very few features of Direct3D 10 in order to be considered Direct3D 10-compliant. In the current generation of GPUs, videocards such as ATI's X800 series were labeled Direct3D 9.0-compliant even though they weren't capable of executing Shader Model 3.0 instructions; by the same token, Nvidia's latest GPUs remain incapable of performing both high dynamic-range lighting and anti-aliasing at the same time. With the exception of a few very high-end features, Direct3D 10 is an all-or-nothing affair.

Microsoft expects everyone to benefit from this requirement: Software developers—especially game publishers—will feel empowered to create more sophis-

Continued on page 70→

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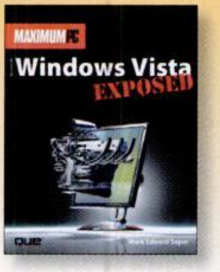

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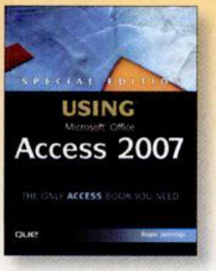

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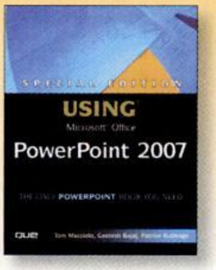

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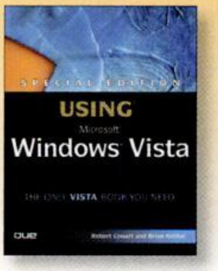

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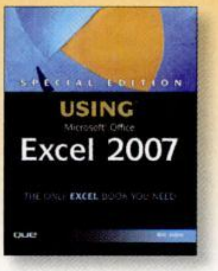

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Continued from page 68

Direct3D 10

ticated products, because they'll have confidence that consumers will have the hardware required for a good experience. Consumers will be able to buy videocards without having to read the fine print to determine if they support a key feature. And videocard and GPU manufacturers can continue offering a range of products targeted at low, medium, and high price points.

WHAT'S NEXT FOR ATI AND NVIDIA?

We asked representatives from both ATI and Nvidia for their take on Direct3D 10 and Shader Model 4.0. Considering the competitive relationship between the two companies and the fact that they're both readying Direct3D 10 GPUs for shipping, the answers we received were, not surprisingly, guarded. We'll provide each company's official line along with the most-repeated rumors and our own educated guesses as to what they'll do next.

ATI has gone on the record that its first DirectX 10 part—code-named the R600—will use a unified shader architecture; in fact, ATI has already built one such chip: the Xenos GPU used in Microsoft's Xbox 360 gaming console. ATI's justifications for this decision parallel Microsoft's: namely, that Direct3D 10 will reduce the overhead that developers must contend with in Direct3D 9.0. ATI claims that the R600 will substantially outperform previous-generation hardware when it comes to running Direct3D 9.0 games, too.

Rumor has it that the R600 will feature 64 shader units that can be dynamically assigned to run vertex-, geometry-, or pixel-shader routines. As for a release date, ATI would tell us only that it's not tying its product launch to Microsoft's Vista timetable. That ambiguous answer could mean the part will ship after Vista is released, but the smart money is on a late-2006 date.

Nvidia has been more circumspect on the subject of architecture, declining to state whether or not its first DX10 part—code-named G80—will feature unified shader units. Nvidia's chief scientist, David Kirk, however, has been widely quoted as saying that a unified architecture isn't necessarily superior to having single-purpose units. Indeed, a GPU need not be based on a unified architecture in order to be DX10-compliant. The only official comment Nvidia was willing to provide is that the company's next-generation GPU will fully support Direct3D 10 while "continuing to improve [performance with] the current DirectX APIs."

The rumor mill says the G80 will have either 32 or 48 pixel-shader units and 16 vertex-shader units that will also handle geometry-shading chores. If this is true, the G80 could be considered a hybrid design because those combo vertex/geometry

Continued on page 72→

Is the incredible detail in this *Crysis* shot courtesy of Direct3D 10 and Shader Model 4.0, or just skilled use of old-school D3D 9.0 and SM 3.0? Only Crytek knows for sure.

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Continued from page 70

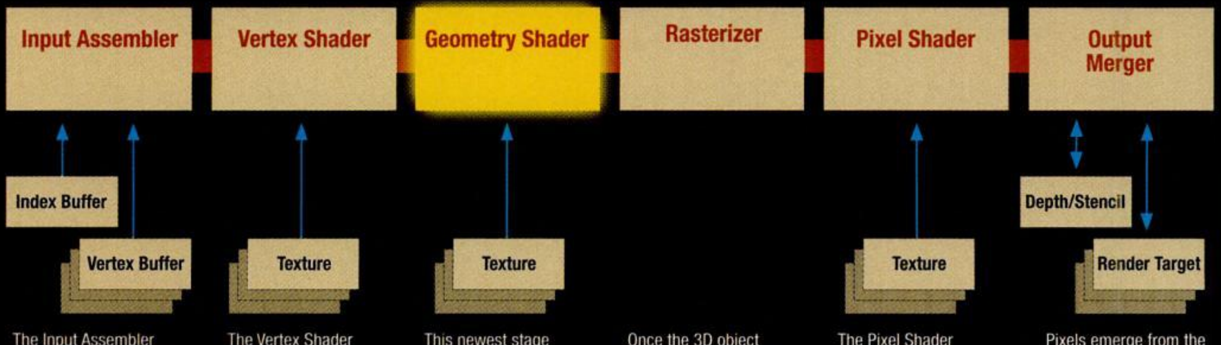
Direct3D 10

Until there's a healthy installed base of Direct3D 10 videocards, game developers such as Crytek will undoubtedly produce hybrid games capable of falling back to Direct3D 9.0 hardware.

shader units are pulling double duty. We speculate that Nvidia is hedging its bets for two reasons: First, the company doesn't have any experience building unified shader units, so going to a hybrid architecture as an interim step entails less risk. Second, most developers won't build games that require Direct3D 10 hardware until there's a substantial installed base. Taking advantage of Shader Model 4.0, while continuing to hew closer to current programming practices, could give the company a performance advantage when it comes to real-world benchmarks. We won't know who has the better solution until we get both products in the Lab, but Nvidia says it fully expects to beat ATI to the Direct3D 10 punch, committing to announce and ship its new product before the Christmas holiday. MPC

THE DIRECT3D 10 PIPELINE

The addition of a geometry shader marks one of the most significant changes ever made to Microsoft's Direct3D pipeline. Any videocard claiming Direct3D 10 compliance must have shader units capable of executing geometry-shader instructions.



The Input Assembler gathers data from up to eight streams attached to the vertex buffers and assembles the vertices.

The Vertex Shader transforms vertices from object space to clip space.

This newest stage of the Direct3D pipeline is capable of operating on the entire primitive all at once. It's also capable of spawning many vertices from a single source vertex.

Once the 3D object has been created, the Rasterizer breaks it down into its smallest components: pixels.

The Pixel Shader operates on the individual pixel fragments, assigning color and depth values to each pixel.

Pixels emerge from the Pixel Shader and enter the Output Merger, which performs stencil and depth-testing operations and render-target blending.

THINK FREEDOM.
7
8

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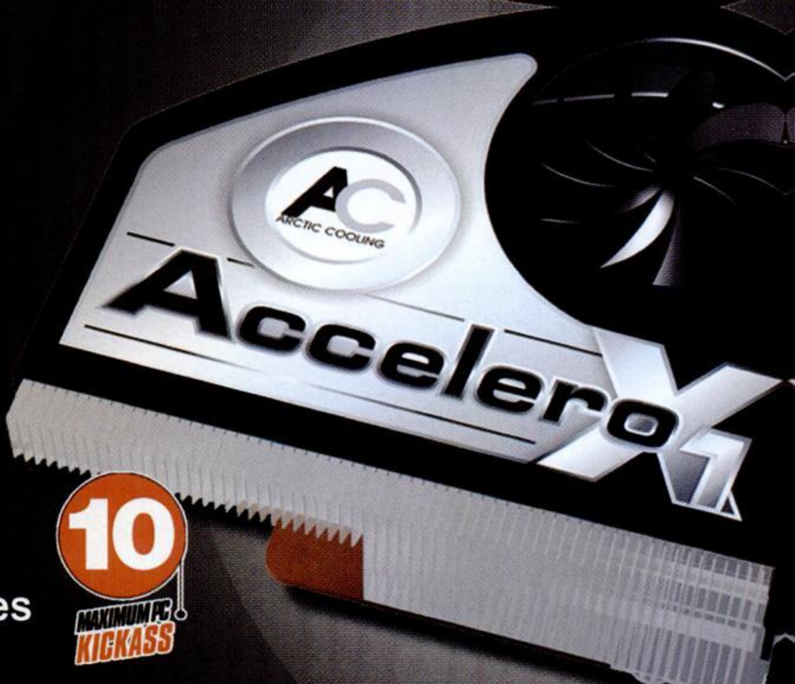

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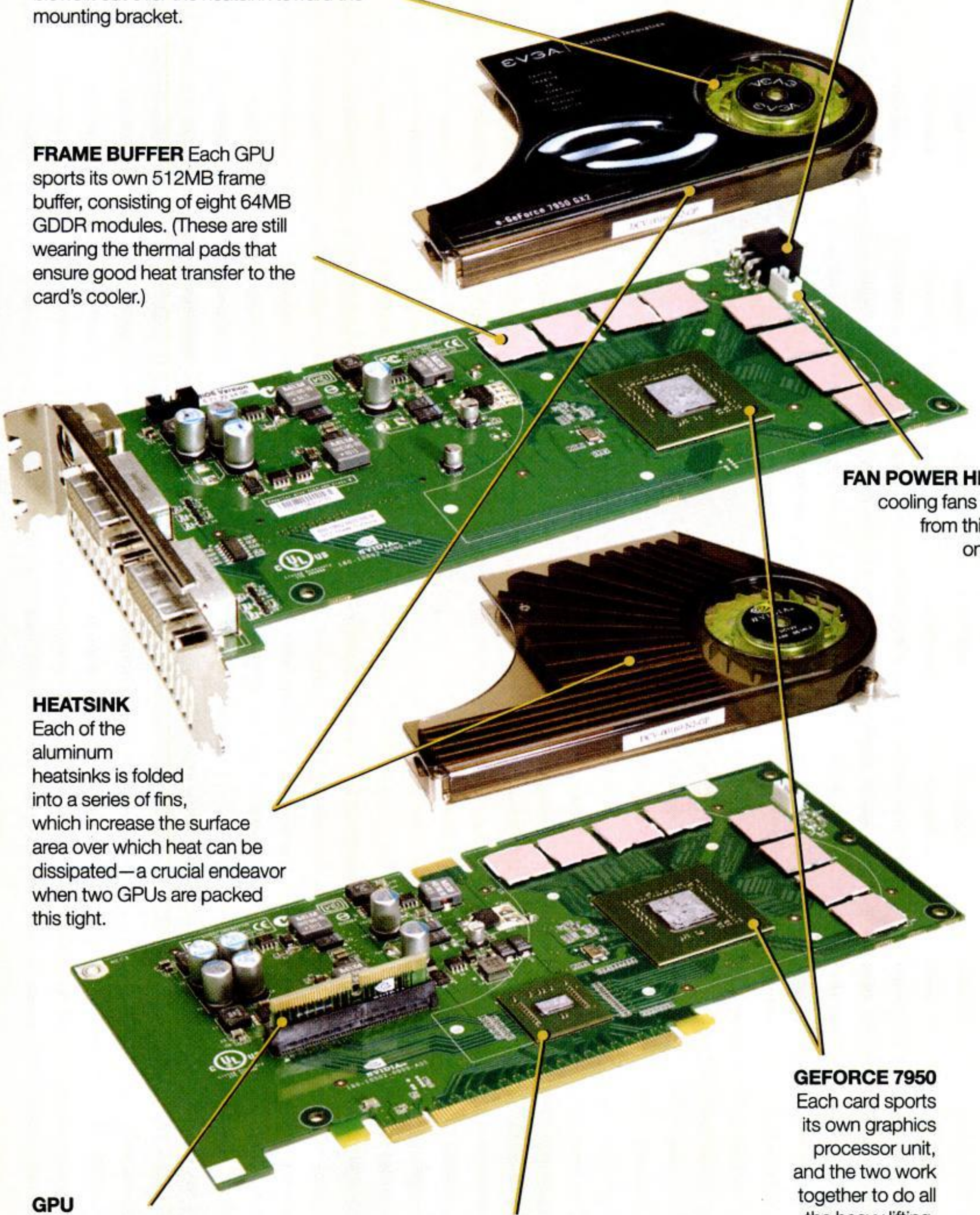
Dual-GPU Videocard

The only thing more fun than benchmarking expensive hardware is taking it apart. We were particularly curious to see what makes nVidia's GeForce 7950 GX2 tick, so we sacrificed this EVGA board to the autopsy knife.



COOLING FAN A 40mm variable-speed fan on each card draws air in at its hub and blows it out over the heatsink toward the mounting bracket.

PCI-E POWER CONNECTOR Unlike a conventional dual-card configuration, the 7950 GX2 card requires just one six-pin PCI Express cable from your PC's power supply.

FRAME BUFFER Each GPU sports its own 512MB frame buffer, consisting of eight 64MB GDDR modules. (These are still wearing the thermal pads that ensure good heat transfer to the card's cooler.)

FAN POWER HEADER The cooling fans draw power from this connector on each of the two cards.

HEATSINK
Each of the aluminum heatsinks is folded into a series of fins, which increase the surface area over which heat can be dissipated—a crucial endeavor when two GPUs are packed this tight.

GEFORCE 7950
Each card sports its own graphics processor unit, and the two work together to do all the heavy lifting.

GPU INTERCONNECT
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NVIDIA PCI EXPRESS SWITCH This proprietary chip directs traffic between the dual GPUs and frame buffers and the PCI Express bus.

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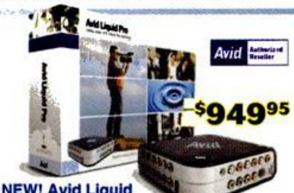

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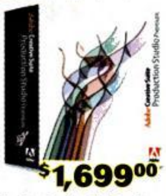

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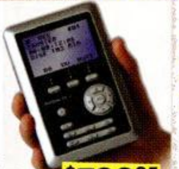

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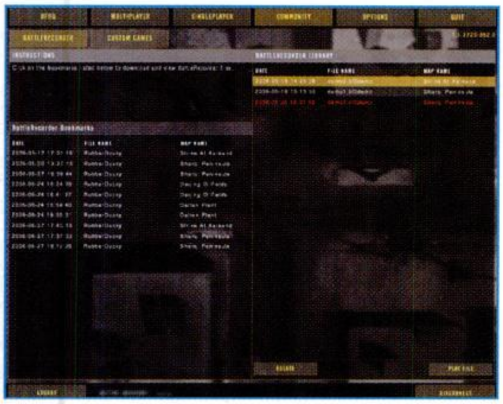
BY GORDON **MAH UNG**

1 Play the Game

It doesn't get any easier than this. Fire up *Battlefield 2* and look for a server that supports the game's BattleRecorder feature. BattleRecorder lets the server record everything that happens in the game on the server side, so you have a record of all the events that transpired during the entire game. You can tell which servers support BattleRecorder by using the BattleRecorder filter in the in-game server browser, or by looking for the BattleRecorder icon by the server name (it looks like a TV screen). Once you've found your server, just jump in and play.

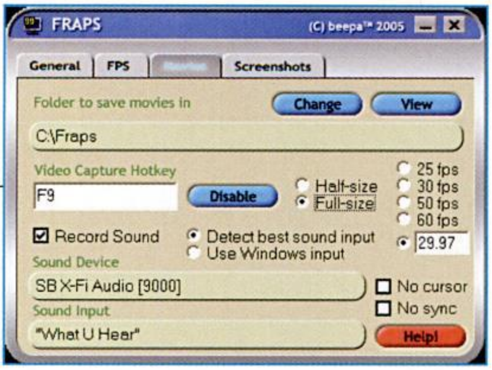
2 Download Your Demo

When the round is over, hit Escape and go to the Community tab of the main *BF2* interface. On the left side, under BattleRecorder Bookmarks, you'll see the files available for download. Simply click one, and hit download. If you get an error, the server you were on probably doesn't have the recorder mode properly configured. In that case, you'll have to look for a properly configured server, using trial and error. We find that most of the properly configured servers will let you download the file after the match is over. (Note: If you wait too long, most servers will have purged the file, even though *BF2* will still indicate that it's available for download.) Once you've downloaded the file, it should appear on the right-hand side of the screen under BattleRecorder Library. Select the demo and click Play File. *BF2* will load normally, but instead of the usual spawn point screen, you'll find yourself in an observer mode, sometimes off the map. If the demo works, you're good to go. Add the server to your Favorites and consider it your own little Hollywood back lot.



3 Fraps It

OK, you've downloaded your video and verified that it works. Now exit *BF2* and fire up *Fraps*. You'll use *Fraps* to convert your onscreen play to an AVI file that can be edited by any video editing program. *Fraps* is a fantastic tool that everyone who is into computing performance and gaming should own. It lets you capture screenshots and videos from any application, and it can even display an overlay of the frame rate of a DirectX or OpenGL game. Its usefulness extends beyond this how-to, so it's definitely worth $37. *Fraps'* default video capture key is F9. *Fraps* should default to capturing video in full frame mode at 29.97fps, perfect for our project. Keep *Fraps* running, then start *BF2* again and load up your demo file.



Folder to save movies in: C:\Fraps

Video Capture Hotkey: F9

○ Half-size ● Full-size

○ 25 fps ○ 30 fps ○ 50 fps ○ 60 fps ● 29.97

☑ Record Sound

● Detect best sound input ○ Use Windows input

Sound Device: SB X-Fi Audio [9000]

Sound Input: "What U Hear"

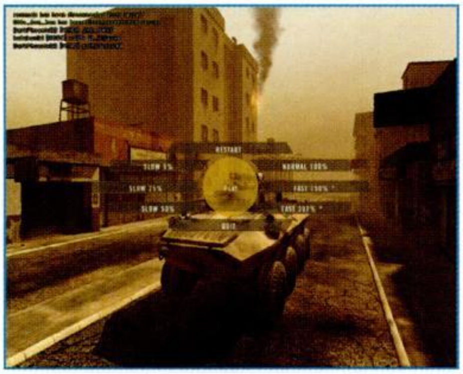
☐ No cursor

☐ No sync

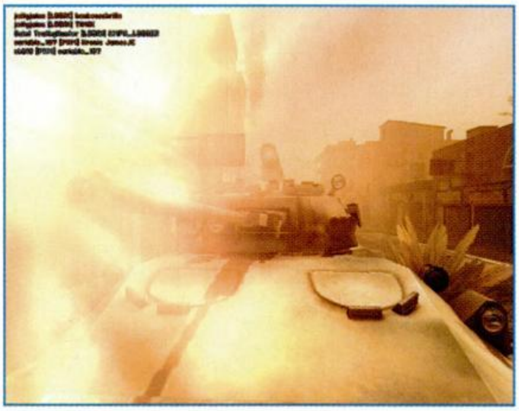
Continued on page 78→

Continued from page 77

4 Be a Cinematographer



When the demo's playing, hitting the Q key gives you the ability to pause, play, speed up, or slow down the playback of the demo. The demo starts in freelook mode, allowing you to fly around the map using the normal WASD keys and the mouse to change directions. The mouse's right-side button switches between freelook and locked-on-an-individual modes. Hitting the space key toggles through all the players in the game. Once the camera locks onto a player, the mouse will let you orbit the camera around the player while the mouse's scroll wheel zooms the camera in and out. You can fly around the map looking for the particular "scene" you want, or if you want to capture your own acts of valor, simply follow yourself.



5 Action!

You're ready to record yourself smoking five OPFORs with the M9 Beretta. You should shoot the first take as a "tracking shot" just over your shoulder. Queue up the scene to just before it's about to start and hit Q to pause playback. Hit F9 to start Fraps' capture mode, then press Q to restart playback. When the scene is over, hit F9 to stop Fraps. Hit Q, select Restart, and queue up the scene again. Repeat the sequence by shooting the same scene from different angles so you'll have lots of options to get the best action when you're editing your footage. You should also "film" some B-roll footage—a close-up of the muzzle or a long shot down an empty street—which you can cut into the main scene for spice.

6 Performance Problems?

Running *Fraps* in recording mode at the same time as *Battlefield 2* can put a strain on older machines. Running 2GB of memory in your rig will likely alleviate performance issue—*BF2* loves RAM. If you have a dual-core processor, you might want to set the affinity of *BF2* to run on a single core. *Fraps* seems intelligent enough to confine itself to one core, so by setting it to the other core you can help ease the strain on your system. To do this, you need to open Task Manager and click the Process tab. Right-click BF2.exe and select Set Affinity. Uncheck one of the pro-

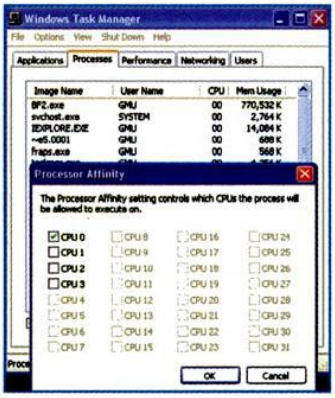

Windows Task Manager
File Options View Shut Down Help
Applications Processes Performance Networking Users
Processor Affinity
OK
Cancel

Image Name	User Name	CPU	Mem Usage
BF2.exe	GMU	00	770,532 K
svchost.exe	SYSTEM	00	2,764 K
IEXPLORE.EXE	GMU	00	14,084 K
~e5.0001	GMU	00	688 K
fraps.exe	GMU	00	568 K

The Processor Affinity setting controls which CPUs the process will be allowed to execute on.

☑ CPU 0
☐ CPU 1
☐ CPU 2
☐ CPU 3
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7 Time to Edit

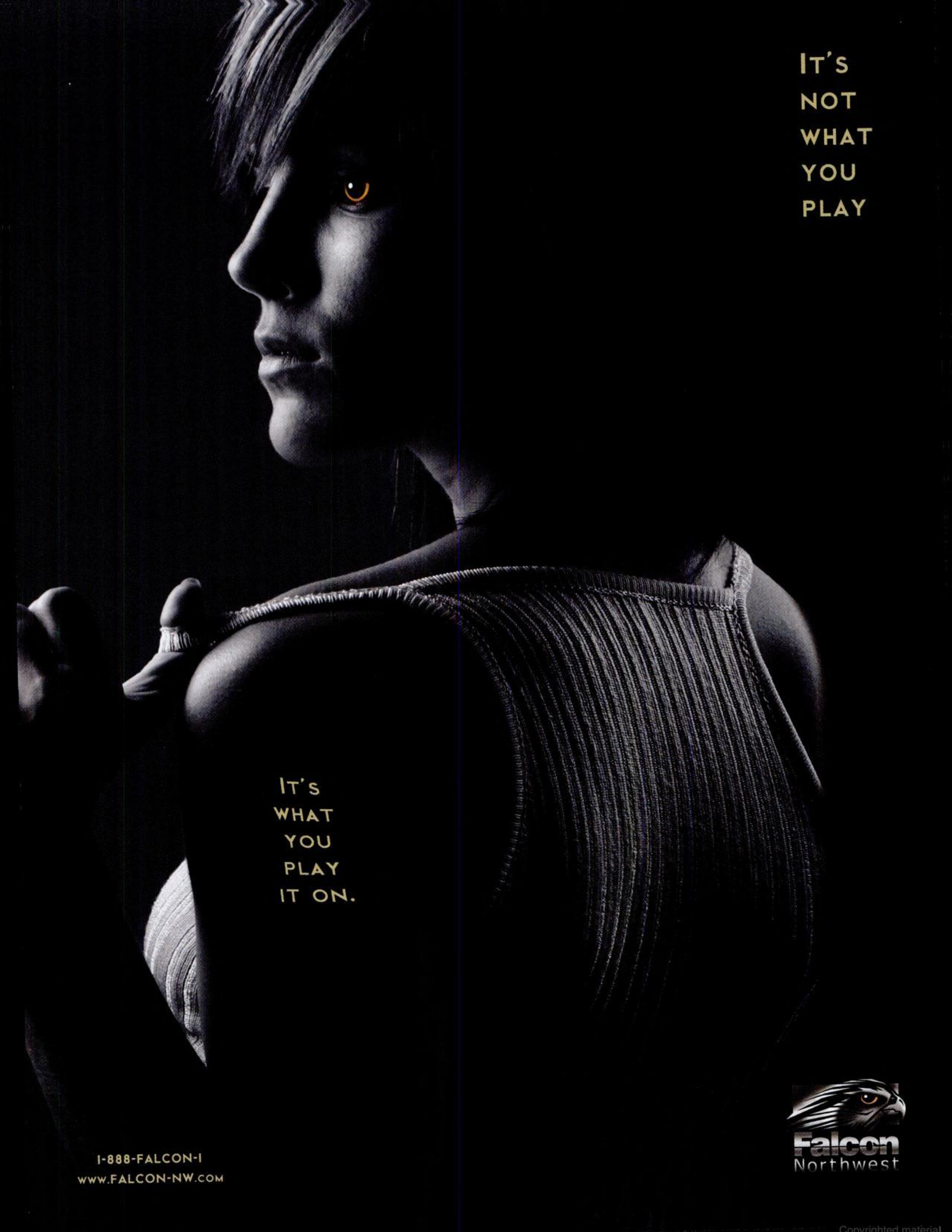
By default, your captures will be saved to the C:\fraps\ folder. If your PC has enough horsepower, you can just leave *BF2* running in the background while you alt-tab out. This makes it easy if you decide you're not happy with a certain scene and want to reshoot it, but you should probably shut down the game when you open your editor. We used Adobe's *Premiere Pro 2.0* because we had it installed on our test bed, but *Pro* is overkill for this project. Adobe's $80 *Premiere Elements* will handle the job just as well, and because both apps share many features, all of our editing tricks will work in either app (except where noted).

To get started, import your AVI files from the *Fraps* directory into *Premiere* by right-clicking the Program pane and clicking Import. Point it at the C:\fraps\ directory and grab the appropriate files. Pick your scene and drag it from the Project tab into the timeline. Now trim the footage until it's just what you want. You can do this by selecting the clip on the timeline and grabbing the end until a red bracket shows up, slide it left or right to make your cuts.

8 Add Some Fast Cuts

Any student of Michael Bay can tell you that following the action from only one angle gets boring fast. Because all of your scenes are of the same subject but shot from different angles, all you need to do is splice them together in a visually stimulating way. In our video, we follow our Marine engineer over his shoulder as he drops mines in front of the two rampaging APCs. Then, as the Marine reaches the top of his arc, we switch angles so the camera is in front of him. Finally, we switch to a third shot with the camera in freelook mode that shows our Marine running past the APC as he drops another mine. When all three scenes are edited together, it's an exciting montage.

Continued on page 80→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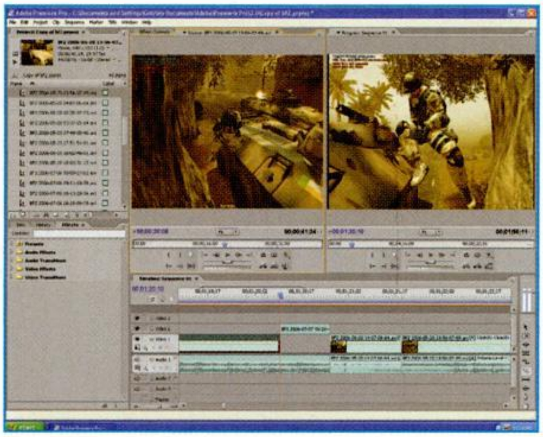
Continued from page 78

8 Add Some Fast Cuts *[continued]*

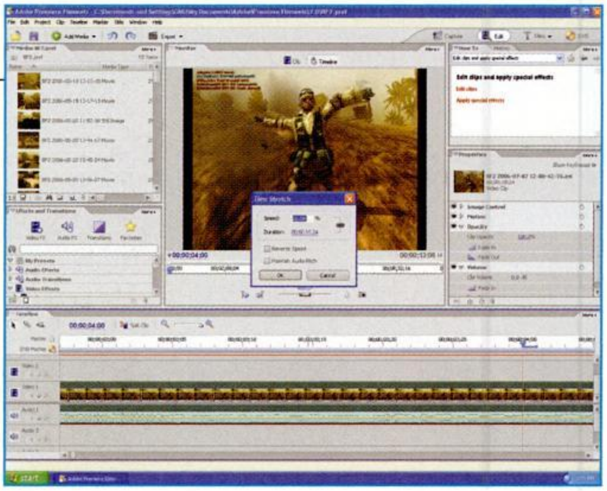


But we need the soundtrack to be continuous. If you don't sync the audio perfectly, there will be distracting pops and clicks as the video clips change. The easiest way to make the audio perfect is to use the soundtrack from a single clip, then sync the video with that. We took our audio from our unedited over-the-shoulder shot by right-clicking the clip and selecting Unlink. *Premiere* only displays video from the topmost timeline, so if you place the unedited video track below the edited video in your timeline, you'll see only the edited video. Get your edited clip synchronized with the audio track, then right-click the edited clip and select Delete Audio to remove the excess audio.

Then, switch back to the selection tool by hitting "V" and go through the same process for all of your clips. Remember, don't always keep the camera on your virtual actor. You can cut between the action of the object firing and object being fired upon for more drama.

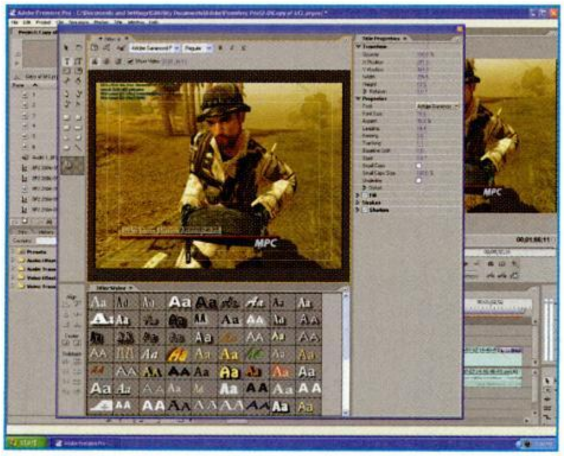
9 Slow It Down

What would a modern war movie be without slow motion? When the APCs open up on two hapless Marines running down a hill in our movie, we splice several scenes together and add a slo-mo effect. To do this in your movie, select the scene you want to slow down and use the razor tool to cut it on the timeline. In *Premiere Pro*, you right-click the selected scene and select Speed/Duration. In *Premiere Elements*, select the scene and choose Time Stretch. You can also apply the fast-cut technique to change camera angles. In our example, we follow the Marine in slow-motion from the front, and then from over his shoulder, and then back to the front, in slow motion, when he takes a hit. We close with a shot as he and his buddy lie crumpled on the ground with the firing APC in the background. That's powerful stuff.



10 Add Titles and Transitions

Titles will help explain your story so add them where they're needed. In *Premiere Elements*, create a title by selecting the Title button on the upper right-hand side of the screen. The title will show up as an asset in the Project tab on the left side of the screen. To add it, drag it from the Project tab to video track 2 in the timeline. You can change the opacity of the title by right-clicking the title in the timeline and choosing fade-in and fade-out. A thin line in the timeline's video track will also let you manually change the opacity or transparency. The method is similar in *Premiere Pro 2.0*. Select Title, then New Title, and pick your style. Like *Elements*, once you've entered the title, it shows up in the Project tab as an asset. Drag this over to the timeline into video track 2 or 3, over the spot where you want it to appear. You can change how long the title is on the screen in either application by grabbing the end and dragging it to change its length. The easiest way to set opacity in *Premiere Pro 2.0* is to set it under Title Properties when you create the title. Otherwise, you can adjust opacity by clicking the Title after it's been placed in the timeline and bringing up the Effects window.



11 Add a Soundtrack or Voice-Over

We didn't add a soundtrack to our small video for copyright reasons, but it's easy to do. Go to the Project tab on the left side of the screen in either version of *Premiere* and click Import. Point it to your favorite MP3, such as Samuel Barber's *Adagio for Strings*. Once it's in the asset list, you can drag and drop it onto the audio 2 or audio 3 track.

If you're really ambitious, and want to record a voice-over or dialogue to go with your movie, simply record them as WAV or MP3 files, add them as assets, and drag them into the part of the timeline where your soldiers are "speaking." MPC newegg.com®

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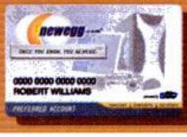

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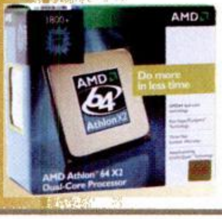

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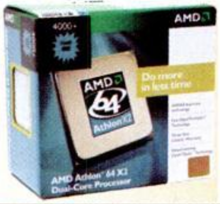

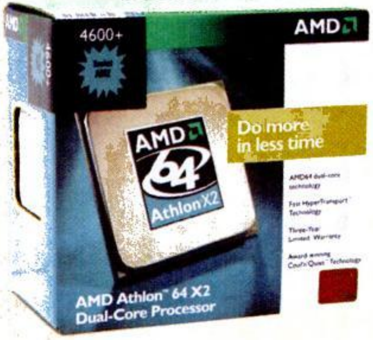

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Revitalize Your **Games** with **Mods!**

MAKE *OBLIVION* AND *HALF-LIFE 2* NEW AGAIN WITH FREE MODS AND TOTAL CONVERSIONS!

BY JOEL **DURHAM JR.**

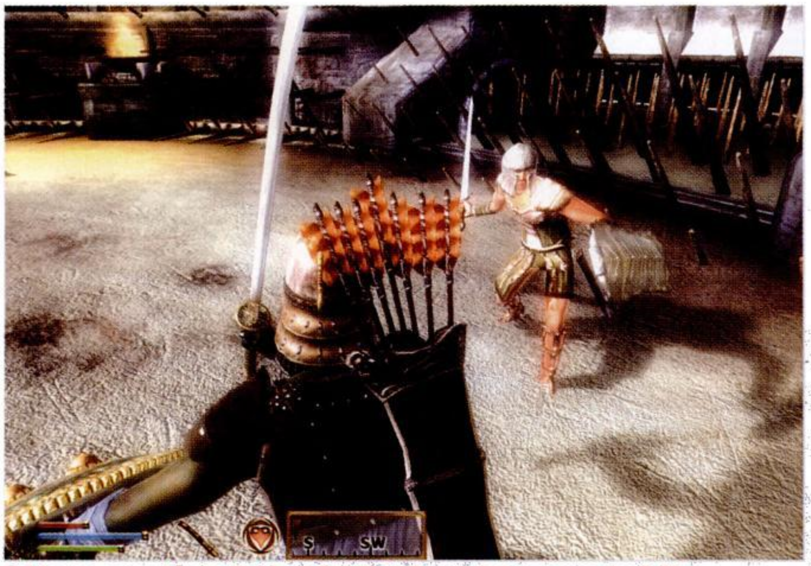
You paid the big bucks for *Half-Life 2* and played it through — three times. You've tried Valve's Steam-based extras, like *Counter-Strike Source* and *Team Fortress Classic*, but heck, those games got old a few years ago. How can you milk your investment further without pouring more cash out of your wallet?

Such is the cry of the unenlightened gamer who's never tried a mod. We're not talking about PC case mods: whipping out a Dremel and tearing your computer to shreds is fun, but it's hardly extending your gaming dollar. Game mods are similar in nature, except they involve someone else tearing a popular game to shreds and transforming it in some way. Mods of all different shapes and sizes are waiting online for you to download them—for free! These range from files that make only a few minor tweaks to the game balance—such as altering the damage value of a .45-caliber slug—to mods that bring entirely new experiences to a game.

A mod can be many things. It might be a set of tweaks to an existing single-player experience, such as the *Half-Life 2 Substance* mod, which brings more challenge to a title that some found to be a bit too easy. Others pack new content, such as models, maps, and textures, into a bundle intended for single- or multiplay. The most intense mods are called total conversions (TC), and they remove virtually any trace of the existing game and build an entirely new experience upon its code. Essentially, mods are the same games you're used to, only different.

A mod can be the work of anyone, from the developers of the game in question to ambitious hobbyists. Normally, its makers use building tools provided by the game's development house or publisher—something like (and sometimes called) an SDK: a software developers' kit. Stopping short of releasing the source code for anyone to download, an SDK gives modders the tools to change textures, script sequences, and alter just about any part of a given game. As an example, you can get the *Half-Life 2 SDK* via Steam.

Lots of mods are available online, but not all of them are good—in fact, most of them aren't worth the download time. Not to worry, though: We've done a lot of the legwork for you already in the following pages. Then we walk you through making your own killer zombie mod for *Oblivion*! (See page 91.)



Odds are, a mod is available online that fixes whatever you don't like about *Oblivion*.

Modded Games: What's Hot

Half-Life 2 isn't the only juicy game that modders love to rework to their own designs. Plenty of other titles are subject to heavy modification.

Mods aren't anything new. People have been modding games since pornographic versions of Infocom titles (think *Zork*, with bad words and sex scenes) made their rounds on gaming-bulletin-board systems in the 1980s. *Doom* was (and still is, somewhat) a popular game to mod in its heyday, but the game that really blew the doors off the mod scene was...*Half-Life*.

We bet you thought we were going to say *Quake*, didn't you? That was a big one, but *Half-Life* had two things going for it: its revamped *Quake/Quake 2* engine mesh was incredibly, well, modular, and hugely successful mods for it, like *Team Fortress* and *Counter-Strike*, became wildly popular.

The most popular-to-mod titles today include *The Elder Scrolls IV: Oblivion*, *Doom 3*, *Unreal Tournament 2004*, *SWAT 4*, *Battlefield 2*, and *Microsoft Flight Simulator 2004*.

Continued on page 84→

Bring in the Mods!

The Internet is rife with mods for dozens of games past and present, and all you have to do to find them is point your browser at your favorite search engine and type the name of the game followed by the word "mods." That might not take you to the most popular mod hangouts, though, and it may be overwhelming for some of the more popular games. These sites will get you started on the right track!

GameSpy's Modify column

http://pc.gamespy.com/index/modify.html

Written by *PC Gamer*'s own Andy Mahood, this bi-weekly series showcases great mods for a variety of games and points you to the right place to download them.

FilePlanet

http://www.fileplanet.com

Okay, so registration is required. That's okay: this clearinghouse for all things gaming includes sections on mods for your favorite games. For example, FilePlanet is where we got most of the *Oblivion* and *Half-Life 2* mods described above.

mod db

http://moddb.com/

This site features a searchable database of mods for games ranging from *Age of Empires III* all the way back to *Wolfenstein 3D*! If you own a game and mods exist for it, you'll probably find them here.

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Continued from page 82

Must-Try Oblivion Mods!

Oscuro's Oblivion Overhaul

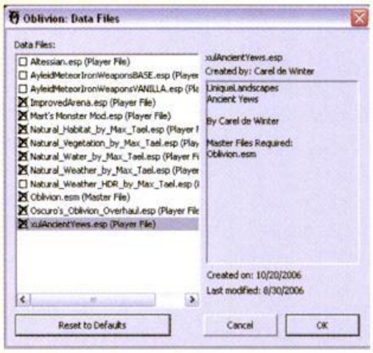
http://jorgeoscuro.googlepages.com/

Referred to by those in the know as *OOO*, this massive mod lives up to its quite literal name. It changes a whole bunch of aspects of *Oblivion*, most notably the scaling thing that has so many players of more traditional role-playing games up in arms. Scaling, in *Oblivion*, means that at any given time the game's enemies will be around the same level as your character, and therefore the same level of challenge. That was done so you could go anywhere at any time in the massive land of Cyrodill without fear of encountering super-powerful beasts.

OOO takes leveling more seriously. As you level up, more of the game is revealed, and monsters become more challenging (and loot more rewarding). Beyond that, it adds loads of new creatures, new treasures, new NPCs, new armor, new textbooks, and much more. You won't see, for instance, female guards in *Oblivion* without *OOO* installed.

Speaking of which, you install this mod (and most other mods) by extracting its contents into the game's existing folder on your hard drive, which in this case is the xx:\Oblivion\Data folder. Furthermore, you must copy one of the .ESP files from the \Data\Oscuro's Oblivion Mod\OOO-FULL or \OOO-LITE into the \Data folder. (You don't have to do this with most *Oblivion* mods.) Check out the long and detailed information .DOC file for more detailed instructions.

When you launch *Oblivion,* click the Data Files option in the front end and fill in the checkbox next to the *Oscuro's Oblivion Mod* option (and next to any other mods you wish to apply; *OOO* is compatible with most of them—see screenshot above).



Oblivion: Data Files

Data Files:

☐ Altessian.esp (Player File)
☐ AyleidMeteorIronWeaponsBASE.esp (Player
☐ AyleidMeteorIronWeaponsVANILLA.esp (Pla
☒ ImprovedArena.esp (Player File)
☒ Mart's Monster Mod.esp (Player File)
☒ Natural_Habitat_by_Max_Tael.esp (Player F
☒ Natural_Vegetation_by_Max_Tael.esp (Play
☒ Natural_Water_by_Max_Tael.esp (Player Fi
☒ Natural_Weather_by_Max_Tael.esp (Player
☐ Natural_Weather_HDR_by_Max_Tael.esp (I
☒ Oblivion.esm (Master File)
☒ Oscuro's_Oblivion_Overhaul.esp (Player File
☒ xulAncientYews.esp (Player File)

xulAncientYews.esp
Created by: Carel de Winter

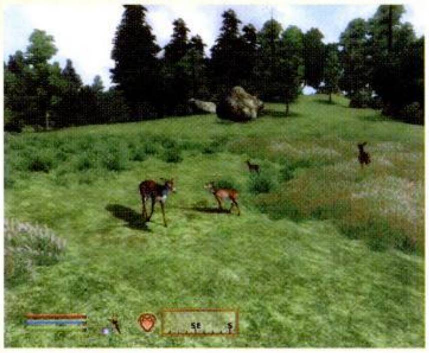
UniqueLandscapes
Ancient Yews

By Carel de Winter

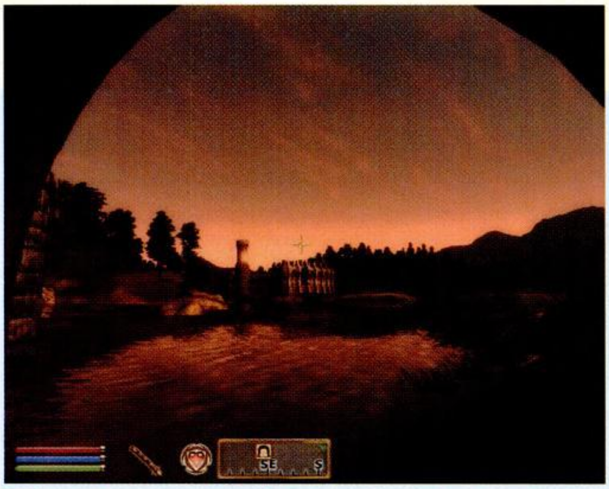
Master Files Required:
Oblivion.esm

Created on: 10/20/2006
Last modified: 8/30/2006

Oblivion was built from the ground up to be mod-friendly. Simply tick the boxes to load or unload mods at will.



Those baby deer are part of new crop of animals featured in *OOO*. You don't want to be a Bambi-killer, do you?



That golden glow is brought to you in part by the *Natural Environments* mod.

Natural Environments

http://www.gameborder.com/game/Oblivion%20Natural%20Environments%20Mod/

"*Oblivion* vanilla," as it's called without any mods installed, is a fantastic-looking game. It could, however, look even better—if you don't believe us, check out the *Natural Environments* mod. The changes don't affect gameplay; they're merely eye candy, but they're so worth it! *Natural Environments*' feature list is long and varied, including all kinds of new weather in seasonal patterns, prettier night skies, and even rainbows. It makes the water clearer, the sunsets more colorful, and the game's entire atmosphere more realistic. Amazingly, it has little effect on performance.

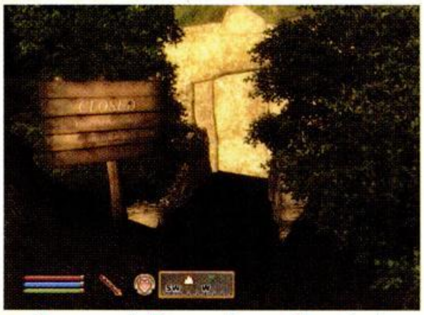
Unique Landscapes: Ancient Yews

http://www.fileplanet.com/166764/160000/fileinfo/Elder-Scrolls-IV:-Oblivion---Unique-Landscapes-:-Ancient-Yews

Some *Oblivion* mods look to change the landscape of the game, but few do it with the verve of *Unique Landscapes: Ancient Yews*. Featuring thicker forests with more trees (including the English Yew, which Robin Hood's bow made famous), it also introduces nifty mist-over-water effects, new locations, and more. This mod's goal is to pack *Oblivion's* environments the way they were meant to be.

Mysteriously, this mod includes a location with a sign that points to Longman's Barrow. It remains to be seen what this sealed tomb will hold. Stay tuned for future updates to the mod—most mods are updated frequently with new versions.

Continued on page 87→



Longman's Barrow is a unique feature of *Unique Landscapes: Ancient Yews.*

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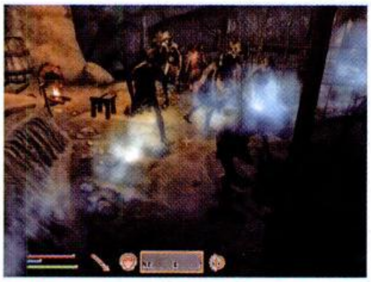


At last—all the goblins aren't the same size anymore!

Martigen's Monster Mod v. 1.0

http://www.fileplanet.com/167262/160000/fileinfo/Elder-Scrolls-IV:-Oblivion---Martigen's-Monster-Mod

Oblivion has a large stable of monsters, but apparently there just weren't enough for some folks. To the delight of horror fans everywhere, *Martigen's Monster Mod* adds a whopping 50 new entities to the game, changing the sizes of NPCs and the bad guys you encounter and adding entirely new creatures that weren't part of the game at all.

It also tweaks the attributes of some of the existing monsters. For instance, rats no longer carry treasure. Undead creatures don't offer pelts and meat anymore. Giants are truly giant, as are some of the other creatures. Even monsters of the same species can vary (see the screenshot at left), so that all the beasts of the same type aren't exactly the same size.

Improved Arena

http://www.fileplanet.com/169184/160000/fileinfo/Elder-Scrolls-IV:-Oblivion---Improved-Arena

The opponents are tougher and the spikes are sharp in *Improved Arena*.

In *Oblivion*, the arena is a cool locale in which you can bet on matches and even get involved, working your way from a lowly pit rat up to the Grand Champion. You may have noticed, however, that the opponents tend to be pushovers. As Mr. T would say, *You're a paper champion!* Not anymore. With *Improved Arena*, the combatants are a real challenge to defeat. Moreover, the arena itself is adorned with spikes—and with floor traps that shove you right into them! It won't be so easy to become the Grand Champ anymore, but the reward is worth it: the mod also adds an unfurnished house for the winner.

Jarrod's Texture Mod

http://www.fileplanet.com/162170/160000/fileinfo/Elder-Scrolls-IV:-Oblivion---Jarrod's-Texture-Mod

Just as the *Natural Environments* mod raises the eye-candy factor on atmospheric phenomena, *Jarrod's Texture Mod* brings new glory to the landscape itself. Feast your eyes on it, and you'll wonder why *Oblivion* didn't look like this in the first place!

Jarrod's Texture Mod requires a bit of effort to install. First, unzip everything in the zip file's \landscape\ folder into your \Oblivion\Data\ folder. Then, unzip the text file called "archiveinvalidation.txt" into the \Oblivion\ folder. There's no need to "activate" this mod through the Data Files interface: it's automatic.

Happenin' *Half-Life 2* Mods

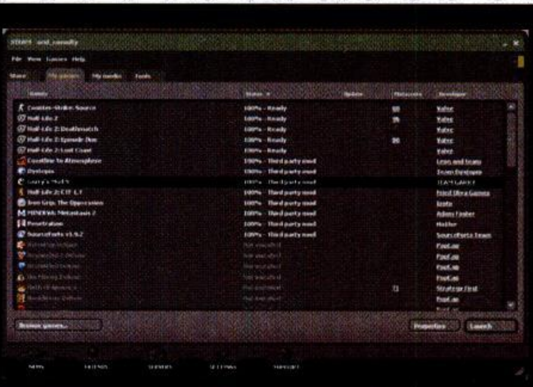
Garry's Mod 9

http://gmod.garry.tv/

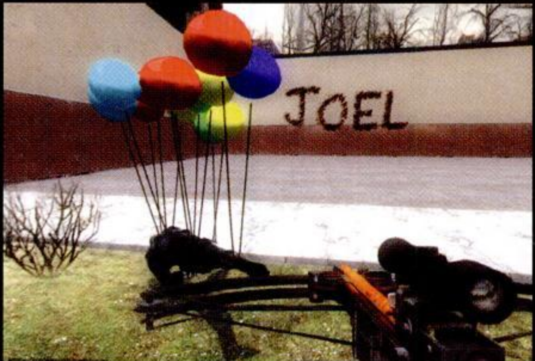
We can't say for sure, but we wouldn't be surprised to find that this is the most popular *Half-Life 2* mod on the planet. That's because you can do *anything* in this mod that you could possibly do with the *HL2* engine. Physics is your playground and lighting your plaything in *Garry's Mod*, and your imagination is the only thing keeping you from enjoying them.

Install *Garry's Mod* (and just about any other *HL2* mod) simply by decompressing all of the files into your \Valve\Steam\SteamApps\SourceMods directory. If Steam is open when you perform the installation, you'll probably have to close it (right-click on the tray icon and click Exit) and then launch it again. *Garry's Mod* should then appear in Steam's "My Games" list (see screenshot at right).

Fool around with it for a while, and when you're utterly baffled, visit the wiki at *http://gmwiki.garry.tv/* because, honestly, there's enough to do with this mod to fill this entire magazine. To make things even more confusing, *Garry's Mod* is a "moddable" mod, meaning that users create modifications that plug into *Garry's Mod* itself. Less of a typical mod and more of an institution, *Garry's Mod* is a must for any *HL2* mod collection. (Note that at press time, *Garry's Mod* version 10 was imminent. Visit *http://www.garrysmod.com/* for more information.)

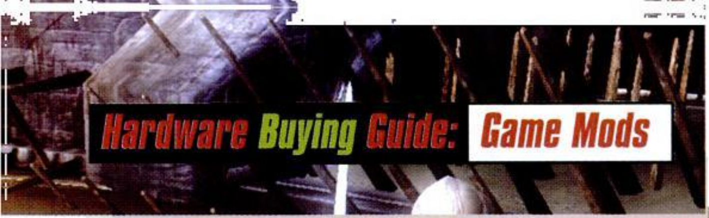


If you installed your mod correctly, you'll see it in Steam's "My games" list.



Yes, I really did write my name on the wall in blood and attach a bunch of balloons to this Combine corpse.

Continued on page 88→



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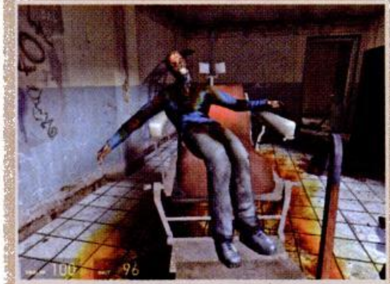


Apparently, this dude got bored to death waiting for you! Mods like *Minerva* expand *HL2*'s replay value.

Minerva: Metastasis 2

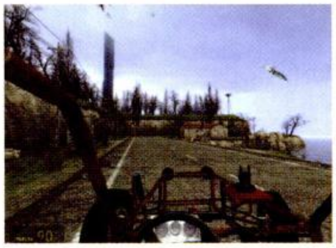
http://www.hylobatidae.org/minerva/
http://developer.valvesoftware.com/wiki/MINERVA

Minerva is a single-player series of episodic mods for *HL2*. The plot is almost as mysterious as *HL2*'s: you find yourself hanging beneath a helicopter approaching a small island. You receive instructions from someone—who? why?—as you play through the levels, which are being released incrementally. Your first orders: get to the beach, turn right, and *run*!

You see, the Combine has already spotted you. Armed with only a pistol and a submachine gun, you're taking fire the moment you gain control of your character. Your overall goal, as much as you can expect to learn from whoever's ordering you about, is to discover the secret of the island, and survive—if you can.

Penetration

http://www.fileplanet.com/167270/160000/fileinfo/Half-Life-2---Penetration-Mod



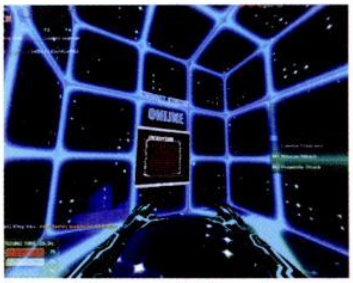
Not only is that another Citadel in the distance, but that gunship's got you in its sights—and that's just the beginning of *Penetration*.

Another single-player powerhouse, *Penetration* puts the pressure on poor Gordon to penetrate another Citadel. This one's in City 18—a hop, skip, and a jump down the way from City 17—and getting there really is only half the fun. Packed with vehicles to drive, gunships to assault you, and plenty of Combine to fill you full of holes, *Penetration* reeks of professionalism.

The G-Man makes an appearance when you start a new game, explaining to you that he's going to use you yet again. Apparently, Gordon's been in stasis since he blew up the first Citadel, and he awakens in an alley next to a factory on the waterfront. It's lonely and eerie at first, but not for long. The Headcrab Zombies that you meet in the beginning are the least of your worries.

Dystopia

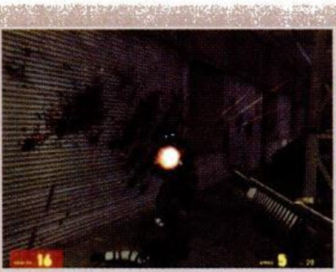
http://www.dystopia-game.com/



I expect to see a light cycle around here somewhere...

Why include a demo of a mod? Because it's *that good*. *Dystopia* is nothing less than a total conversion that puts you in a team-based multiplayer environment in which you have a choice: cooperate with your teammates or lose. The action takes place inside and outside of cyberspace, and to accomplish your team's goals you'll have to visit both.

In the real world, you can deck yourself in three types of armor—ranging from light to heavy (à la *Tribes*)—and choose from a cadre of weaponry and enhancements. One of your tasks is to protect the helpless bodies of the dudes jacked in to cyberspace, where they try to capture nodes while facing enemies within.



Cappin' the Combine never gets dull, and there's an endless supply to cap thanks to mods like *Coastline to Atmosphere*.

Coastline to Atmosphere

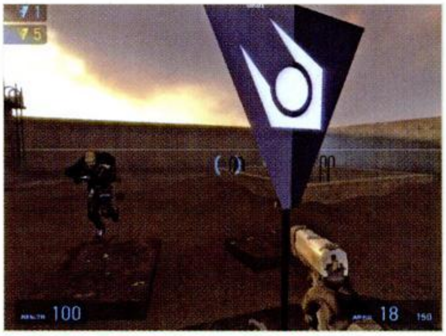
http://www.planetphillip.com/posts/leons-coastline-to-atmosphere-single-player-half-life-2-mod/

Picking up where *HL2* finished, this fantastic single-player mod packs a series of maps that put you back in Gordon Freeman's iconic suit. You've spent three long months in a small coastal town healing since your fall from the exploding Citadel. Now it's time to find Breen and finish that mother off.

Of course, the Combine isn't about to make life easy on you. You'll find yourself heavily engaged within moments of loading up *Coastline*, and the pressure just doesn't stop. You'll battle through lush, tropical-looking environments and intense Combine installations as you close in on Breen, searching all the while for someone—anyone—to help you...

Half-Life 2 CTF 1.7

http://www.hl2ctf.com/



A flag. An enemy. Get to work!

A must-have multiplayer total conversion. *CTF* stands for *Capture the Flag*, and CTF mods have been a staple of first-person shooters since at least the original *Quake*. The goal is simple enough: guard your team's flag while stealing the enemy's flag and returning it to your base. The tough part is that the other team is up to the exact same thing!

Half-Life 2 CTF requires both *HL2* and *Half-Life 2 Deathmatch* (which you can get through Steam) to be installed, as it's actually a conversion of the latter. It includes a slew of weapons old and new, plus power-ups, turrets, and even the mysterious machine-pistol that Alyx used to take out baddies alongside Gordon in *HL2*.

Continued on page 91→

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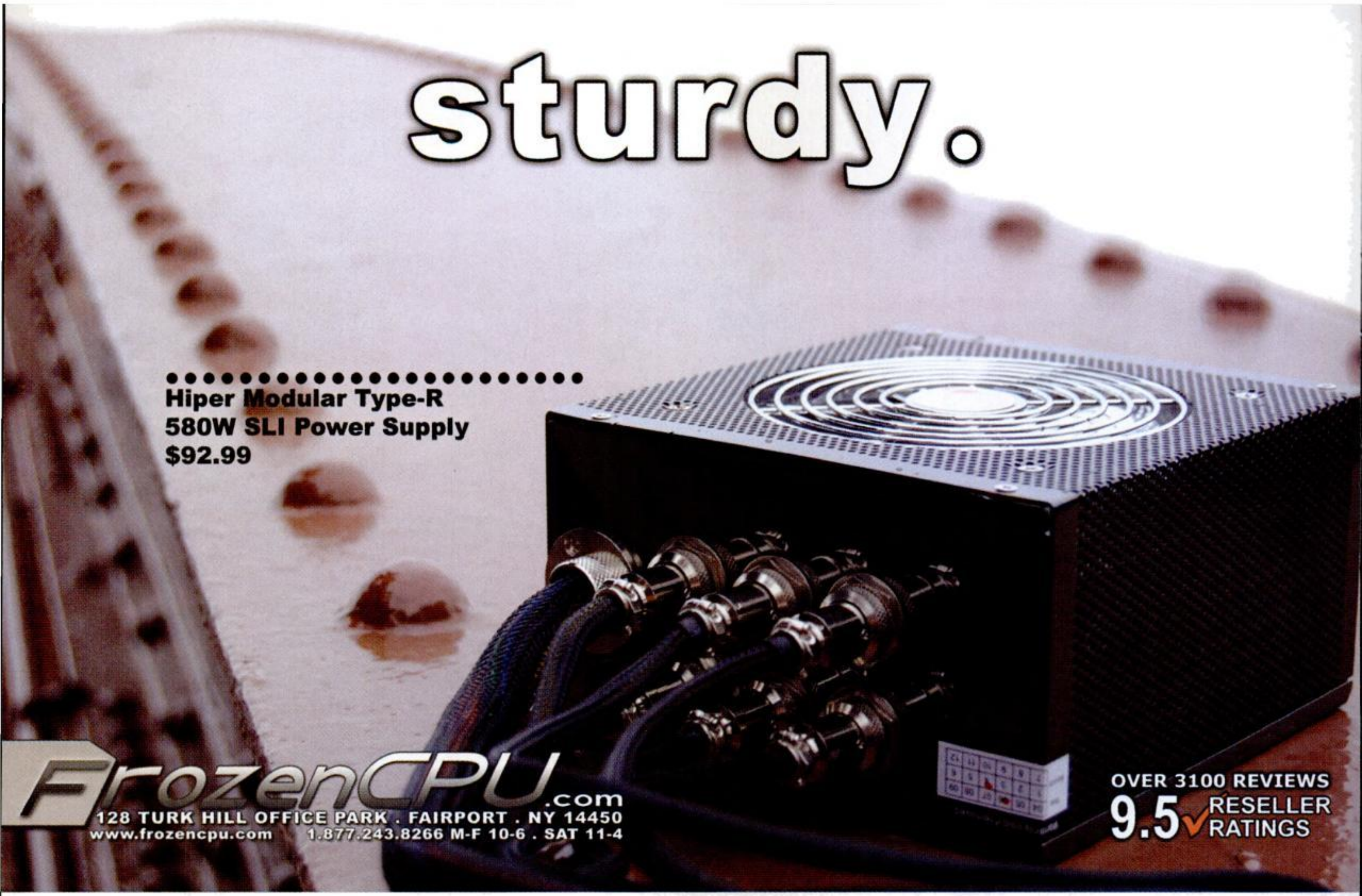

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Continued from page 88

Create Your Own **Zombie** Massacre In **Oblivion**

WHAT YOU'LL NEED

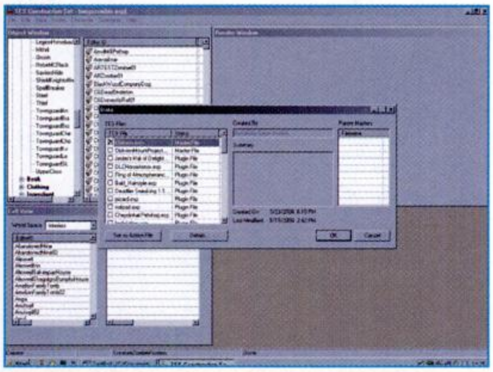
- A decent PC: This mod will cause huge fights that lesser PCs will struggle with.
- The Elder Scrolls Construction Set: the official *Oblivion* editor, available at **http://static.bethsoft.com/Oblivion-Const-Set.exe**
- The "No Essential NPCs" *Oblivion* mod: **www.tessource.net/files/file.php?id=2137**

TIME 1:00 HOUR

BY TOM **FRANCIS**

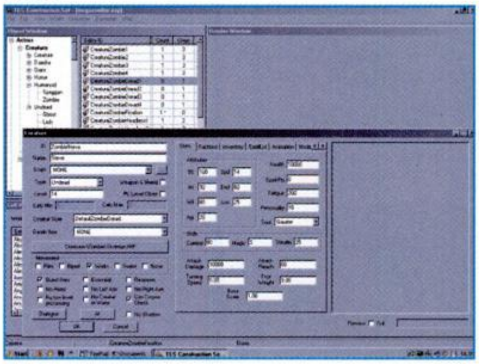
Unleash this guy upon *Oblivion*'s cities! Mmm, brains.

1 Evil Master Plan



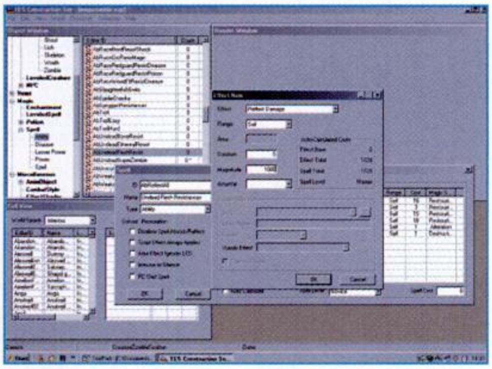
We're going to build a zombie capable of destroying all life in Cyrodiil, because frankly, we're in a bad mood. Creating a simple zombie is straightforward, but things get more interesting when we tinker with its brain to give it a little wanderlust. The Elder Scrolls Construction Set is the only tool we need: fire it up, go to File>Data Files, and check "Oblivion.esm". The editor will load the original *Oblivion* game data so we can mod the hell out of it.

2 Frankenstein Stirs



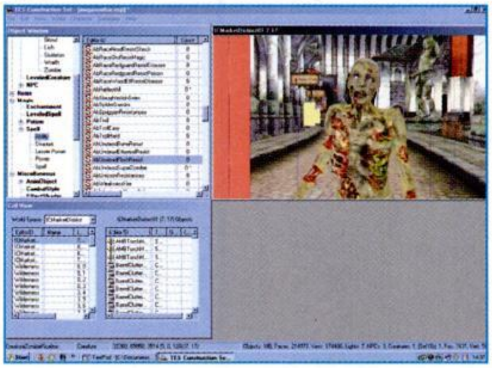
We can save time by basing our creation on the existing Dread Zombie. In the Objects window, top left, look under Creatures> Undead>Zombies and double-click "CreatureZombie Dread1". Change its ID in the properties window to ZombieSteve (or whatever you wish to name your brain-eater), uncheck "No low level processing," and then set health and damage to 10,000 or so. Don't worry about overwriting the Dread Zombie—changing the ID means we've created a new being.

3 A Proportional Response



To give Steve some protection, bring up the Object Viewer, look under Magic>Abilities for AbUndead-FleshResist, then double-click it to edit. Change its ID to "AbReflectEmAll", so we don't make every zombie in the world invincible. Right-click and go to New to add Reflect Damage, Magnitude 1,000, and Reflect Spell, Magnitude 1,000. In ZombieSteve's properties window, switch to the Spells tab, and then drag this new ability to his list of spells there.

4 Cell It to Me



In the Cell View window (bottom left), click the Worldspace dropdown box and find ICMarket District. In the list that appears below, double-click ICMarket-District1 to open it in the Render Window (top right). We're a bit high up, so click the window and mouse wheel up to zoom in. Drag the middle mouse button around to find a clear spot, and then drag ZombieSteve from the Object View to his new home in the capital. Press F to drop him.

Continued on page 92→

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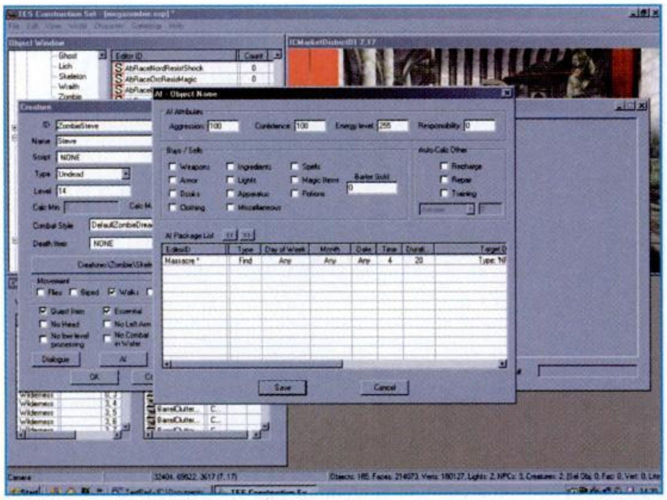
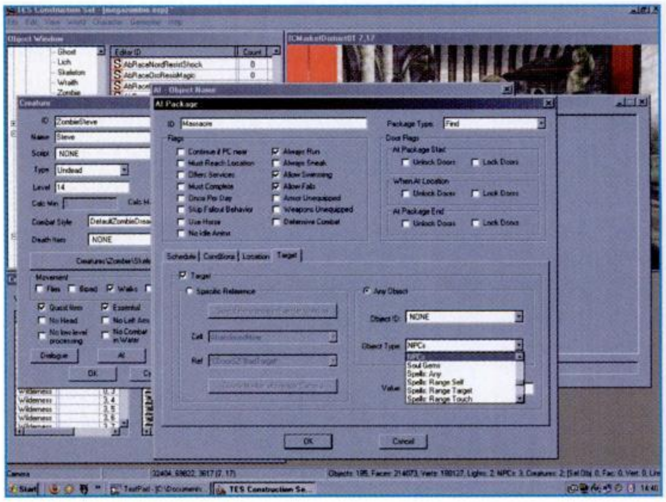


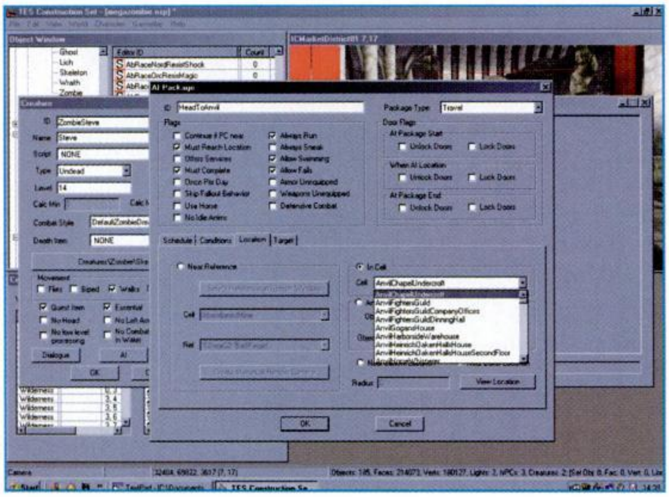
5 A Day in the Undeath of Steve

Despite his all-brain diet, Steve is stupid, so let's give him some artificial intelligence. Open him up and click the AI button. That box at the bottom is where we tell Steve what he likes to do. For another NPC, that might be work on weekdays, pints at the pub during happy hour, and dinner at 8 p.m. With Steve, it's hunting down and gorging himself on every living soul on the planet, all day long.



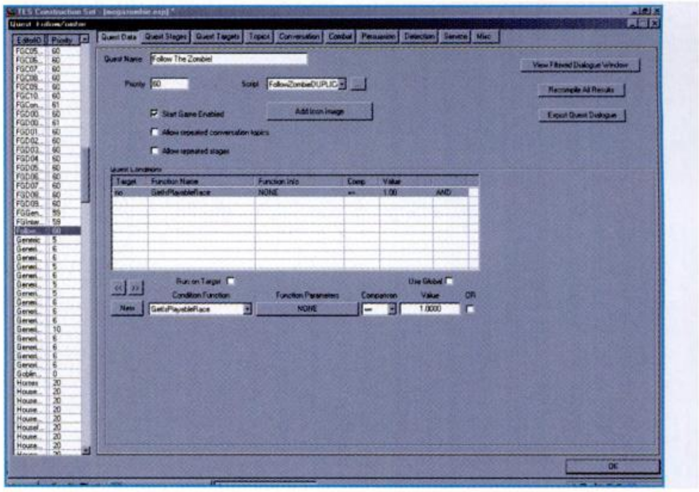
6 My Wanderin', Festerin' Heart

Each directive is called a Package. Right-click Steve's AI list and add a new Package. Then, select Find from the Type listbox. What do we want him to find? People. Go to the Target tab, check the Target box, and set an Object Type of NPC. Click the Location tab "Near Editor Location" and enter a huge value like 999,999: this will let him roam freely to find victims. Finally, click the Schedule tab and set Time to 4 and Duration to 20—you'll see why later.



7 Rotting All Over the World

Let's give Steve a weekly tour of Cyrodiil's crypts. Right-click and select New to add another Package; make this one a Travel type. Check "Must Complete" and "Must Reach Destination," and then pick Sunday as day of the week, 0 for Time, and 4 for Duration. Click the Location tab and select "AnvilChapelUndercroft" from the Cell menu. Back at the AI menu, add a new package and repeat the process for the rest of the week and for other crypts.



8 Quest for the Corpse

Make Steve the objective of a quest and we'll have a marker pointing to him at all times. Go to Character>Quests, right-click anywhere in the list on the left, and go to New. Call our new quest "FollowZombie." Fill in the Quest Name field with "Follow The Zombie!" and give it a priority of 60. Under Quest Conditions, the only one we want is "GetIsPlayableRace == 1.00".

Continued on page 94→

Go ahead...
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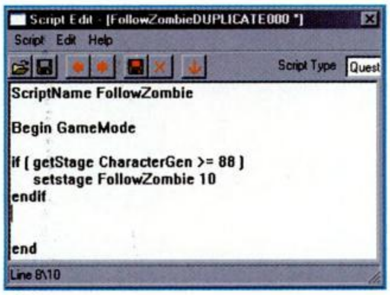
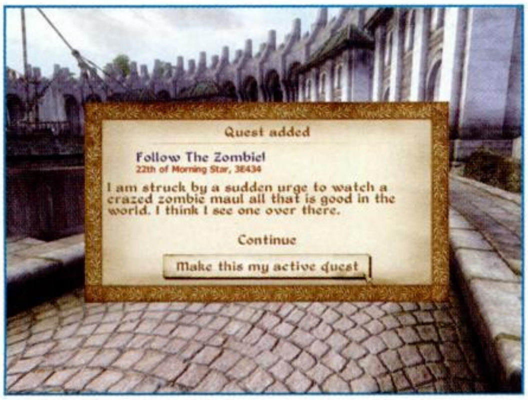


```
ScriptName FollowZombie

Begin GameMode

if ( getStage CharacterGen >= 88 )
    setstage FollowZombie 10
endif


end
```

9 Script Writing

Click the "..." button next to the "Script: None" box to create a new script. The full script we need is shown above—it tells the game to give you this quest as soon as you're out of the character-creation stage. Click Save, then click the red Save icon to recompile all scripts. It'll chuck up a few error messages that you can safely ignore. Once it's finished, you'll be able to select your new FollowZombie script from the list next to Script in the Quest window. Do so!



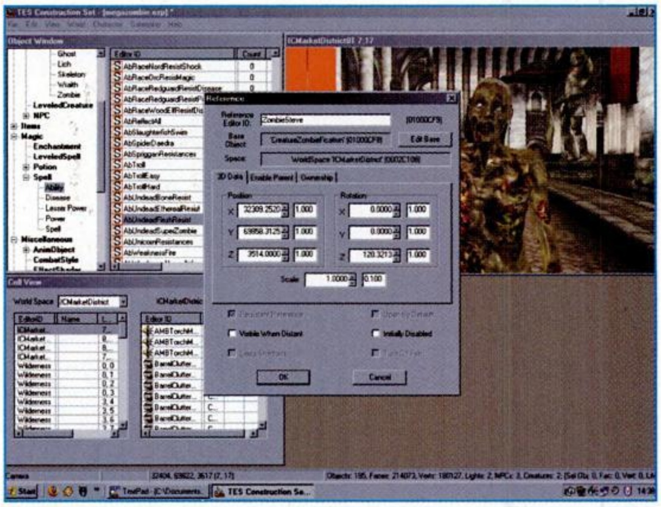
Quest added

Follow The Zombie!
22th of Morning Star, 3E434

I am struck by a sudden urge to watch a crazed zombie maul all that is good in the world. I think I see one over there.

11 Keeping Up With Steve

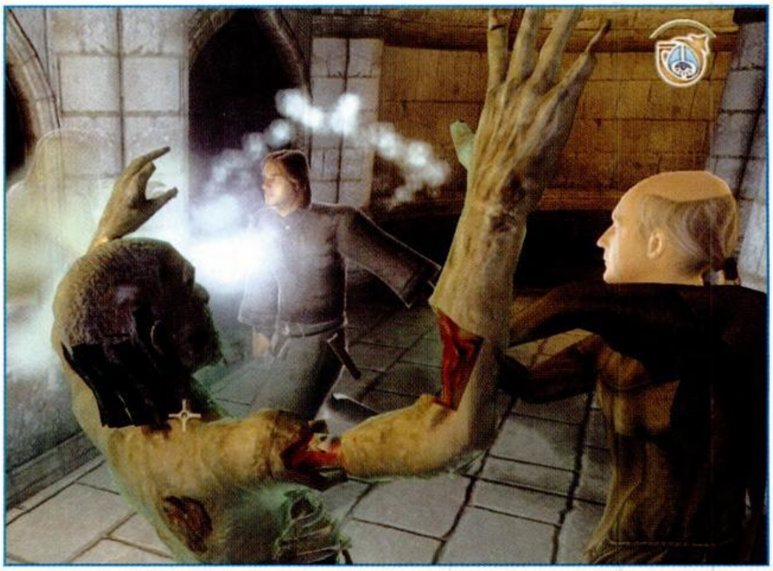
Go to File>Save and call your mod "ZombieSteve." If you want to open it in the Construction Set later, you'll need to select this, as well as the Oblivion.esm from the Data Files menu, and set it as the Active File. Now, when the game's launcher pops up, click "Data Files" and check "ZombieSteve." In-game, load any of your characters and they should get a note about Zombie Steve within a few seconds. Make it your active quest and find Steve to observe the carnage.



Reference Editor ID: ZombieSteve (01000CF9)
Base Object: 'CreatureZombieFication' (01000CF8)
Space: WorldSpace 'ICMarketDistrict' (0002C108)
Position X 32309.2520 1.000 Rotation X 0.0000 1.000
Position Y 63858.3125 1.000 Rotation Y 0.0000 1.000
Position Z 3514.0000 1.000 Rotation Z 120.3213 1.000
Scale 1.0000 0.100

10 Get Zombie

Go to the Quest Stages tab. Right-click and add a stage 10 to the list on the left. Click it and add a new Log Entry with your choice of words. Open up the Market District in the Render Window, find Steve, and double-click him. There'll be a box near the top called ReferenceID—enter "ZombieSteve". Now, head back to the Quest Targets tab of the Quest window and click "Select Reference" in Render Window. Click on Steve and the game will know he's what we're after.



All Fall Down 12

Steve can't kill quest-critical characters, which can be a problem—he'll beat a VIP to the ground, shamble off, and then head straight back as soon as they pick themselves up. We could go through the editor and make all NPCs non-essential, but happily, someone's already done it for us. Download the *No Essential NPCs* mod from *www.tessource.net/files/file.php?id=2137*, and watch Steve rip the game apart with his stinking, flesh-stripped hands.

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For more information on these products go to:
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Contest Rules: No purchase is necessary to win and as a contestant you have not yet won. Entries must be received no later than March 3, 2007. The winners will be chosen on or about March 6, 2007, and will be notified by e-mail (or regular mail). The odds of winning depend upon the number of entries received. The sponsor of the contest is Future US, Inc., 4000 Shoreline Court, Suite 400, South San Francisco, CA 94080. Future US cannot be responsible for lost, late, misdirected, or incomplete entries. The prizes are the following: (1) Toxic X1950 XTX (the value of which is $539); (2) Ultimate X1950 Pro (the value of which is $230); and are nontransferable and no substitutions will be allowed. Winners will be determined by a single random drawing of all valid entries and the decision of Future US shall be final. You may obtain the name of the winner by sending a stamped, self-addressed envelope to the address above. This contest is open to residents of the United States only. Entrants must be at least 13 years of age. If a winner is a minor, the prize will be awarded in the name of winner's parent or legal guardian, who is solely responsible for all applicable federal, state, and local taxes. If a winner is a minor, that winner must also provide a signed parental or guardian consent form, provided by the sponsor, within 7 days of notification attempt. Failure of the minor to return the guardian consent form will result in the forfeiture prize and selection of an alternate winner, who will be chosen through a random drawing from the remaining eligible entries. Return of any prize or prize notification as undeliverable will result in disqualification and an alternate winner will be selected. The winners may be required to sign an affidavit of eligibility/release of liability/prize acceptance within seven days of receipt; failure to do so upon request will result in forfeiture of the prize. By acceptance of the prize, the winners agree to the use of their name and/or likeness for purposes of advertising, trade, or promotion without further compensation, unless prohibited by law. Future US is not responsible for any damages or expenses that winners might incur as a result of this contest or the receipt of any prize. Winners are responsible for paying any income taxes on the value of the prize received. Void in Rhode Island, Puerto Rico and where prohibited by law.

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